THE

ELECTRICAL REVIEW.

VOL. LXXI. OCTOBER 25, 1912. No. 1,822.

ELECTRICAL REVIEW.

Vol. LXXI.] CONTENTS: October 25, 1912. [No. 1,822,

	Page
Commercial Development as it Should be Done	641
Registration of Contractors	642
Turkish Railway Schemes	642
Rotherham Trolley 'Buses (*illus.*)	643
Holborn Street Lighting (*illus.*)	644
Correspondence :—	
Trade with Australia	645
Liability of Engineers	645
Fuse Formulæ	645
Generating Plant for Village Lighting	646
The Use of Mica in Electrical Apparatus	646
Boiling Water	646
Notes from Canada	646
Proceedings of Institutions :—	
Sources of Energy available for Power	647
The Training of Engineers	648
New Electrical Devices, Fittings and Plant (*illus.*)	649
Legal	651
New Fittings Showrooms (*illus.*)	654
Business Notes	654
Electricity Supply Developments at Bradford (*illus.*) (*concluded*)	661
Notes	666
City Notes	669
Stocks and Shares	671
Market Quotations	672
Share List of Electrical Companies	673
Exports and Imports of Electrical Goods during Sept., 1912 ...	675
A Library Scheme for Catalogues and Price Lists	676
Co-Partnership or Trade Unionism—Which?	678
Recent Developments in Wireless Telegraphy : With Special Reference to Ship Installations (*illus.*) (*continued*)	679
Ghent International Exhibition, 1913	681
The Engineering Exhibition at Olympia (*illus.*)	681
Foreign and Colonial Tariffs on Electrical Goods	683
New Patents Applied For, 1912	684
Abstracts of Published Specifications	684
Contractors' Column ... Advertisement pages xxvi xxviii and xxx	

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE :—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 983; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 16, Palmerston Buildings, Queen Street.
BERLIN: Asher & Co., Unter den Linden; Speyer & Peters, Unter den Linden 43, N.W. 7.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: The Mining & Engineering Review, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: The Mining & Engineering Review, 2, Hunter Street; Gordon and Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE UNIVERSAL ELECTRICAL DIRECTORY

(J. A. Berly's).

1912 EDITION.

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

COMMERCIAL DEVELOPMENT AS IT SHOULD BE DONE.

WE British have a reputation, at least amongst ourselves, for letting other nations show us how to do things; then, when the lesson has gone home, we set to work and do them better. It is not one of the traits that we should be proud of; and, happily, the saying is only partly justified. It would be easy to cite instances on either side of the argument, and it is interesting to observe that in this connection the gas and electricity supply industries in this country respectively provide us with such examples.

Some years ago, observing the admirable work done in the United States by the co-operation of a large number of electricity supply undertakings, which jointly organised an extensive campaign for the purpose of developing the business of electricity supply, we drew the attention of British central-station managers to the immense advantages to be derived from combination on these lines, and we published a series of articles on "Commercial Development," detailing the methods which should be adopted in order to emulate our American friends in their progressive and aggressive propaganda. Our example was quickly followed, and the technical Press, at least, did its duty in impressing upon our people the necessity of adopting a forward policy on sound and well-tried lines.

But little result was achieved. In America the business is almost wholly in the hands of private companies, untrammeled by statutes and regulations; here it is mainly conducted by municipalities, which not only labour under the above-mentioned disabilities, but are also hampered by the system of management in vogue, under which the recommendations of a technical or commercial expert, no matter how high his standing, are first discussed and emasculated by a Committee of laymen, and finally have to run the gauntlet of a whole Council whose members are even less conversant with the subject, to speak mildly, than the Electricity Committee. Hence it was impossible to induce the municipal authorities to take any vigorous action in the matter on co-operative lines, and, strange to say, the companies were even slower to realise its importance.

Almost the sole outcome of the movement so far has been the formation of a "Publicity Committee," which, however, is almost helpless for want of funds, and has hitherto confined its activities (save the mark!) to the emission of leaflets, posters, and similar printed matter from time to time. This, as we have pointed out, is, or ought to be, only one branch, and that not the most important, of the work that should be carried on. Lectures, demonstrations, local and travelling exhibitions, and a variety of other methods that have been discussed in our columns, ought to be provided for, and the other not neglected. The supply authorities that have not given their support to the movement ought to be unceasingly angled for, and the needs of those which have already come into the net should be examined and fully satisfied—which is not the case at present, strange as it may seem.

In brief, the movement is half-choked, struggling for life, cold-shouldered. The Committee appears to be listless and apathetic, unable to appreciate its possibilities, lacking imagination and enterprise; and the electricity supply industry, with all its vast potentialities for ameliorating the lot of the most humble worker as well as the "idle rich," is deprived of what might well be made its most effective means of development.

This is the *laissez-faire* side of the picture; the reverse is provided by our keenest rivals, the managers of the gas supply industry. Not long ago, alarmed by the growing competition of electricity—for a good thing cannot be utterly suppressed, even by its own friends—they got together and formed the British Commercial Gas Association. The objects of this organisation were precisely those which we urged on the attention of our central-station managers years ago, and have urged. It is noteworthy that the Association was incorporated under the auspices of the Institution of Gas Engineers. The first annual general meeting of the Association was held at Manchester recently, and was attended by about 400 members and visitors.

The President saw in the Association (says our contemporary, the *Gas World*) "the dawn of a fuller conviction of the unity of interest which unquestionably underlies the diversities and severances of particular gas undertakings"—was he quoting from Mr. de Ferranti, *mutatis mutandis*? It was in the cultivation of the multifarious utilities of gas that the reaction of greater prosperity would be experienced, he said, by every branch of the industry; they must employ every possible means for ascertaining the needs of every class of actual or potential user, so as to fit the service rendered or offered to the circumstances of every consumer. Three requirements presented themselves to his mind: publicity; sales organisation; service development. The President went on to explain that local publicity could be far more economically done with the aid of co-operation; the results already obtained had more than satisfied the subscribers.

The report of the General Committee stated that the list of supporters of the Association included the names of 256 undertakings, and the annual income was £12,500; this was fully utilised in promoting the objects of the Association, which wants more—and will get it. In the first year over 700,000 pamphlets, postcards, &c., had been sold, at a very low price.

We have not space here to detail the proceedings at the general meeting, but we may add that it appears to have been a most successful function. The point we wish to emphasise is that while the electrical people, with an ideal commodity for sale, are temporising with the question, the gas people, although handicapped by the peculiar qualities of their product, are proceeding to carry out with energy and success precisely that policy which we have so often urged upon the former—preaching, alas! to deaf ears.

As we have pointed out, this thriving and very much alive Association was initiated by the Publicity Committee of the Institution of Gas Engineers. We have in the Institution of Electrical Engineers an Industrial Committee, whose functions approximate, at least in spirit, to those of the aforesaid Publicity Committee. It appears to us that the duty of the Industrial Committee is plain; it is to carry into effect the policy advocated by the President, Mr. de Ferranti, and enthusiastically endorsed by the members of the Institution—to promote co-operative effort, to organise a propaganda—in fact, to follow, where it should have led, and to inaugurate just such a campaign as is being established by our rivals. Words are of no avail—action is the thing. Let our watchword be "*Organise*"! The American electrical engineers, the German gas engineers, the British gas engineers—in fact, everybody's doing it. Why don't we? Already the Association has made arrangements for a Jubilee Gas Exhibition, to be held next October at the White City. Can we not provide a necessary and salutary counterblast?

Registration of Contractors.

The announcement that the Corporation of Liverpool is about to publish a new "Current Official List of Corporation Contractors," and that contractors must pay a registration fee of 5s. for the privilege of having their names on this list, suggests a legal question of some nicety. It may be presumed that when tenders are invited, the tenders of contractors whose names are on this list will alone be considered. Any local authority which thus restricts the number of would-be tenderers runs into the danger of infringing any law which provides that tenders shall be advertised. Thus it is provided by the Public Health Act, 1875, Sec. 174 (4), that "with respect to contracts made by an urban authority under that Act, the following regulations shall be observed, namely, ... (4) Before any contract of the value or amount of one hundred pounds or upwards is entered into by an urban authority ten days' public notice at the least shall be given, expressing the nature and purpose thereof and inviting tenders for the execution of the same; and such authority shall require and take sufficient security for the due performance of the same." If to be on the list were a condition precedent to the chance of having a tender accepted, it is obvious that the object of advertising for tenders would be to a large extent frustrated, and we fancy that the Local Government Board might have something to say as to the imposition of such a condition.

Turkish Railway Schemes.

It is announced from Constantinople that notwithstanding the present critical period, the Ministerial Council has found time to settle in favour of the Deutsche Bank, on behalf of a group of German, Belgian and French financiers, the question of the concession for the construction of an underground metropolitan electric railway in Constantinople. The grant of the concession to this group, which is termed the Constantinople syndicate, would appear finally to dispose of the competitive scheme promoted by the French Omnium syndicate. The project sanctioned comprises the construction of a railway from Taxim to Bajadiz, and the undertaking is said to represent the sum of £2,800,000. It will, perhaps, be remembered that the lead in the Constantinople syndicate is taken by the Belgian Société Financière des Transports et Entreprises Industrielles, which is closely associated with the Berlin Löwe group. Among the constituents of the syndicate are the Deutsche Bank, the German Orient Bank, the Dresden Bank, the National Bank for Germany, the Schaaffhausen Bank Verein, and the Berlin Electrical Enterprises Co., several large French banks, and the Belgo-Hungarian financial group of Ganz & Co.; whilst Turkish finance is represented by the Ottoman Bank and the Banque Salonique. The syndicate already controls the Constantinople tramways, which are in process of conversion to electric traction, and which are to be extended by the construction of 13 miles of new lines; the Galata-Pera tunnel railway; the Stamboul gas works, and the Ganz electric lighting concession for Constantinople. It is intended to transform the syndicate into a Belgian company with a share and loan capital of £3,600,000, although the course of political events will probably cause delay in the completion of the transaction. This state of affairs is also expected to defer the execution of the project for the construction of the proposed Bosphorus electric railway, the concession for which was obtained some time ago by the Berlin firm of Lenz & Co., with whom the A.E.G. is believed to be associated in the matter. The firm made a deposit of £35,000 with the Turkish Treasury, and it was recently reported that the Deutsche Bank had offered to pay this amount to the firm if the latter would abandon the Bosphorus railway, which, for a section of the route, would be in competition with the proposed underground railway. The report, however, has proved to be incorrect, whilst the discussion which proceeded some time ago, aiming at the conclusion of an understanding between the syndicate and the Lenz group, is understood not to have been renewed.

ROTHERHAM TROLLEY 'BUSES.

The trolley omnibus system which has recently been inaugurated by the Corporation of Rotherham possesses several features of interest. It includes, in addition to the Rotherham-Maltby route which is now in operation, two other sections of 2⅞ and 2⅛ miles respectively. The Corporation

Fig. 1.—Home-Made Pole-Setting Wagon.

has obtained motor-'bus powers within the borough boundaries, and over an external route subject to the consent of the local authorities concerned. Over the Maltby route, the Corporation previously held motor-'bus powers, which automatically lapsed on the commencement of the trolley-'bus service. Other proposed trolley-'bus routes have not been sanctioned, and there has been considerable railway opposition to the granting of those powers which have been obtained. This is the first case in which a local authority has obtained powers to run trolley-vehicles outside its own boundaries.

The Rotherham-Maltby trackless trolley route will be, for a time, the longest in the country. Starting from the terminus of the tramway extension (1·7 miles from the centre of the town), it passes through the villages of Wickersley (1·8 miles from terminus), and Bramley (2·66 miles) to Maltby (4·75 miles). Until the road widening near the tramway terminus has settled, the 'buses will run 0·64 mile nearer to the town.

Though the route is very undulating, the steepest gradient is 1 in 13·7. There are many curves, and, as a result, the "rake" of almost every pole has had to be different from that of its neighbours: the line work has been further complicated by the fact that some of the poles rest in soft clay and need a cross-rail, while others have to be placed in solid rock.

The district traversed is, at present, sparsely populated, but the opening of the new collieries near Maltby is leading to a rapid growth of this village. Wickersley and Bramley have no railway service, and the only rail communication from Rotherham to Maltby is *viâ* Doncaster, so that the new service will benefit residents along the route, and, while carrying trade to Rotherham, will also benefit local tradespeople by opening out the district for residential purposes. On account of the pretty country, a considerable holiday traffic can be depended upon, and the situation of the collieries at Maltby is such that they are not likely to impair the scenery for some time to come. The populations along the Maltby route are: Wickersley, 960; Bramley, 1,340; Maltby, 1,750; total (in 1911), 4,050. For the present, three standard R.E.T. 'buses are to be employed, and there is little doubt that, in a few years, the increased population along the route will justify the laying of tramrails, thus liberating the 'buses for use on other routes.

The Thrybergh tramway extension was opened for traffic on August 23rd, 1912, and the new 'bus service and Broom tramway extension on October 3rd, 1912. Owing to the recent coal strike, it was impossible to obtain penalty contracts for the line material required, and there has, consequently, been much delay in the delivery of poles. The necessary road widenings are completed to the present 'bus terminus at Maltby, but if it is ever decided to run the 'buses right into, or through, the village, costly street widenings will probably be insisted upon.

In the course of the present extensions, Mr. Lilleker, mains superintendent, has designed and built the ingenious pole-setting wagon illustrated in fig. 1. The tower structure and the jib and struts are composed entirely of standard trolley-pole arms, brackets, tie-rods, &c., erected on an old stone dray, and completed by a simple hand-winch. The cost of this serviceable equipment, which took four days to build, was about £18 (excluding the winch): for an orthodox pole-planting wagon, manufacturers asked £70-£80, and could not deliver in less than three months! The vertical columns of the tower are bracket-arms (with the strut-bars left in place), and the semicircular clamp-ends are bolted through wooden beams and the bottom of the dray. Guard-wire and span-wire clamps and cut-down tie-rods are used, as shown, and practically the whole of the material is available for ordinary use if it should ever be decided to demolish the tower.

The height of the platform is 16 ft. from ground level, but by notching the planks of the platform and increasing the slope of the jib, a greater lifting height will be obtained. Though primarily designed for pole-setting, the structure can be used as an ordinary tower wagon, and finds innumerable applications in loading and unloading drays and shifting drums, piping, and so on. The side tube (here shown reinforced by a wooden prop), is dropped to ground level and clamped whenever it is desired to relieve the dray of a tipping load, and a pulley at the back of the wagon enables

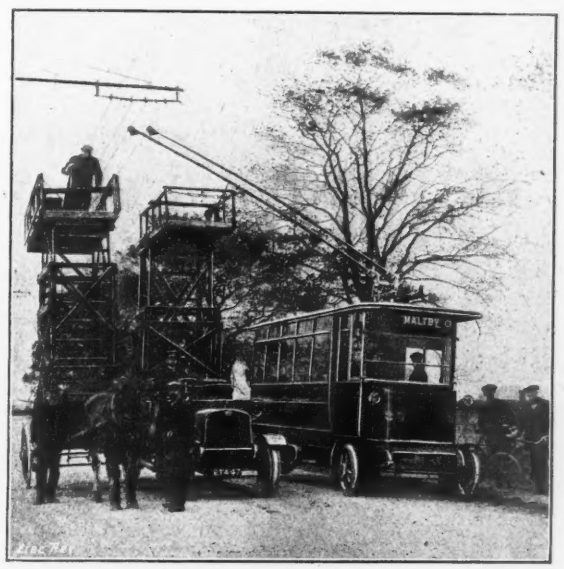


Fig. 2.—Trolley-'Bus and Motor Tower-Lorry.

a flexible steel rope to be run laterally to any article which has to be moved transversely before being lifted. The hoisting gear has been tested to 30 cwt., and six 8-cwt. poles have been set per hour (50 poles, or 1 mile of route, per day), by its aid.

Four 0000 trolley-wires are erected over the 'bus route on standard tramway poles and brackets. The pitch of the poles ranges from 30 yards at bends to 37-40 yards in

straight runs ; the length of the bracket-arms varies from 14 to 18 ft., only a few of the longest lengths being required.

At present, the whole 5·34 miles of route is to be fed through suitable meters from a feeder carried to the tramway terminus, and, as the trolley line is double throughout, and only three 'buses are to be used, it is expected that the voltage drop at the furthest vehicle will not exceed 50 volts (except temporarily). If necessary, a positive feeder will be carried 2 or 3 miles along the route, probably in the form of a fifth overhead wire hung near the inner end of the brackets.

The 'buses are to be of the R.E.T. standard, single-deck rear-entry type, and are practically identical with those already in use at Bradford (Electrical Review, March 29th, 1912, page 492, *et seq.*). Fig. 2 shows the very roomy body employed and the covered-in driver's platform. The swivel trolley head, already described in these columns, enables the trolley boom to clear very high vehicles immediately below the overhead lines (see fig. 2, which incidentally shows the Tramways Department's powerful motor lorry provided with telescopic tower and complete testing equipment for line work). The tare weight of the vehicles will be 3 tons 12 cwt. (considerably less than that of the Leeds and Bradford vehicles), and the total weight with 28 passengers, driver and conductor will be less than 5 tons. A separate smoking compartment is provided at the rear of each 'bus accommodating 16 passengers, and 16-c.p., 105-volt traction carbon lamps with anchored filaments are used for lighting. The vehicles will turn on a radius of 12 ft. (inner rear wheel track). Shrewsbury Challoner tires are used, 32 in. diameter × 4·5 in. on the front wheels and 36 in. diameter × 8 in. (twin), on the rear wheels. The makers guarantee the tires for 10,000 miles, or grant an equivalent cash rebate.

The 'bus specification calls for a speed of 12 m.p.h., fully laden, up a 1 : 10 grade and requires the brakes to stop the vehicle fully laden, from 20 m.p.h. on a 1 : 9 down grade. Two 20-h.p., 525-volt motors are provided, and it is probable that the chain gearing hitherto standard will be abolished or a much heavier type substituted. The insulation of the motors (fully connected), between windings and case, with brushes down, is to be at least 5 megohms, and the windings must withstand 2,000 volts a.c. for 5 min. when at the maximum temperature (not higher than 75° C. above atmosphere) reached during a one-hour full-load test.

A half-hour service is to be maintained, the first 'bus leaving the Maltby terminus at 8·55 a.m. The fare will average 1d. per mile (6d. all the way, with 1d., 2d., 3d. and 5d. stages), and a revenue of about 9d. per 'bus-mile is anticipated. The motor char-à-banc lately running over the route has never had occasion to claim the subsidy promised by the Corporation, so there is little doubt that profitable operation of the new service can be secured.

The estimated capital cost of the three trolley 'bus routes is as follows :—

Feeders, overhead lines, poles, &c. (including erection and 10 per cent. contingencies)	£30,619
Trolley 'buses (14 at £750)	10,500
Proportion of Parliamentary costs	1,000
Total, excluding any allowance for road widenings	£42,119

The tramway department is to pay ⅜d. per 'bus-mile to the road authority on account of road upkeep.

Wages in the Manchester District.—There was recently held in Manchester a conference between employers and employed in the engineering trade of the district, at which consideration was given to an application for an advance of wages made on behalf of 13 Trade Unions, with a membership of more than 12,000 workmen. The *Times* states that it was decided to submit the following terms to a ballot of the societies concerned :—An advance of 1s. in day rates, and of 2½ per cent. in piece prices, the first pay at advanced rates in November. A further advance of 1s. in day rates, and 2½ per cent. in piece rates, to be paid in January. Wages to remain unaltered for three years from January next, and subsequent changes to be subject to three months' notice on either side.

HOLBORN STREET LIGHTING.

Our readers will remember that last year, after tendering against one another for the contract for the public lighting of the borough of Holborn, the rival interests joined hands and submitted a joint tender for the work, which included the supply of all the necessary plant and the maintenance of a specified candle-power for the term of 10 years, at an inclusive payment of £7,645 per annum. Having practically no alternative, the Borough Council accepted this offer, which was but little in excess of the amount paid during the previous 10 years, but provided a greatly increased candle-power and improved illumination throughout the area. The capital expenditure required in respect of new columns, lamps and fittings, &c., was estimated to amount to about £9,000 ; the annual payments for the extinction of this outlay were included in the contract amount above stated, and at the end of the period the new fittings, &c., were to become the property of the Council. The work was put in hand, the gas lighting being carried out by the Gas Light and Coke Co., while the electrical work was done by the

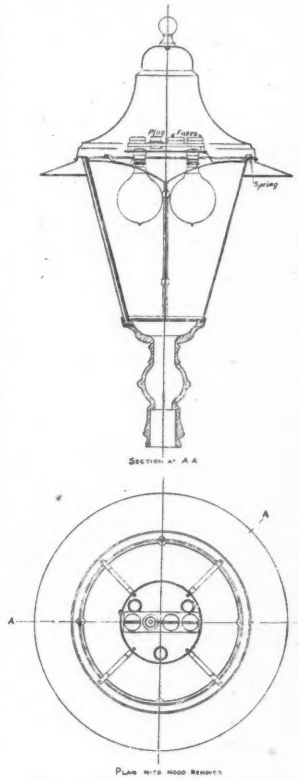


Fig. 1.—Details of Lantern.

Fig. 2.—Electric Lighting Standards in Holborn.

Metropolitan Electric Supply Co., acting in conjunction with the Charing Cross and City Co., and the County of London Co., which are each supplying a portion of the lamps. The electrical part of the contract was put in operation on October 9th.

The whole of the electric lighting has been carried out with incandescent metallic-filament lamps, of the Osram and Mazda types. These are mounted in lanterns of improved pattern, to the design of Mr. J. S. Highfield, chief engineer to the Metropolitan Co., and similar in principle to the ceiling lamps and outside lanterns which are also made under his patents.

The installation comprises an aggregate of about 186,000 c.p., distributed over 13 miles of streets, and is supplied with electrical energy at both 100 and 200 volts, partly d.c. and partly a.c. The supply is derived from the ordinary distributing mains in each locality, and the lamps are switched on and off individually by hand. Five different lighting units are employed, in accordance with the original specification, but practically the lighting is effected almost

entirely with three of these; their candle-power and the number employed of each are as follows:—

C.P....	1,800	600	400	200	90
No. of standards ...	20	5	212	4	717
Distance apart, yards	30	—	15	—	25

In the principal thoroughfares, which are about 60 ft. wide, the lamps are mounted on columns at a height of about 18 ft. from the ground; in the minor streets they are about 10 or 12 ft. high. Almost all the columns are fixed on the footway, and the system of centre suspension from span wires, much favoured by the City of London Corporation, has not been employed in Holborn. Access to the lanterns is obtained by ladders.

The importance of a handsome appearance in the daytime, in addition to high illuminating efficiency at night, has been borne in mind in the design of the lanterns and columns, which are of a novel pattern. The lanterns were made by the General Electric Co., Ltd., Messrs. Veritys, Ltd., and Mr. Haydn Harrison, and are illustrated in sectional elevation and plan herewith (fig. 1). They are practically airtight, and the interior is accessible only through the top. The glass enclosure is of the form of an inverted cone, with four bars, which offer practically no obstruction to the light, and the weekly cleaning is confined to the outside of the lantern. The inside is cleaned only when new lamps are required, and thus the cost of cleaning, as well as the risk of breaking the lamps, is very much reduced. The reflectors are designed to deflect a large portion of the upward rays, so as to aid the illumination at a distance from the columns, and are carried on floating springs, as shown in the section. The switches and fuses used are those of the General Electric Co., Ltd., and Mr. Haydn Harrison, and the connections to the mains are made with rubber-insulated wires.

A general view of a column and lantern is given in fig. 2; ths columns are fixed to special concrete bases, about 18 in. of their length being below the ground level. The lamps are kept burning all night. The largest size of lamp employed is of 600 C.P., the 1,800-C.P. lanterns carrying a group of three of these.

Photometric curves showing the distribution of illumination are not at present available, but the lighting, as judged by the eye, is very effective.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Trade with Australia.

Your issue of August 16th is just to hand, and I have read with interest and appreciation the articles on "Australian Trade."

There is no doubt that Mr. Hamilton-Wickes has done an immense amount of good.

At the present time there is a great tendency in favour of goods "Made in England," and it behoves manufacturers to take every advantage thereof at once.

We represent English, U.S.A. and Continental houses, and this is what we find:—

(*a*) American and Continental manufacturers keep us well posted with catalogues of every description, whilst we have to write to English advertisers to send them.

(*b*) English price lists do not contain such full details as those of their competitors.

(*c*) English houses do not seem to bother to go to the pains to give information in reply to inquiries that their foreign friends do.

(*d*) Continental suppliers appear to make it a pleasure to please and they give careful study to meeting local requirements, whereas English houses expect us to adopt their standards.

(*e*) German and U.S.A. manufacturers push for business energetically, and are real "triers"; on the other hand, we, as a rule, find it necessary to approach British companies.

(*f*) Foreign firms are always ready to cut prices and meet competition; Britishers do not seem to care what the outcome of their quotation is.

(*g*) Foreign deliveries usually appear to be more prompt.

Continental and U.S.A. firms are well represented in Australia, and, despite preferential Customs tariff, are evidently holding their own.

British firms need to wake up; we Australians are patriotic, and push forward British goods whenever we can, although there is more profit in foreign goods; but the local tendency is price first and quality next. Even so, if by paying a little more we can buy the English article, we usually do so.

To get more hold of the colonial markets, the British firms should lay themselves out to study our special requirements.

On one occasion we invited an English firm in one of the Midland counties, and a Berlin manufacturer, to tender to a certain specification, copy of which and sample could be seen at the office of the High Commissioner in London. The Berlin company sent a man to London, but the English one intimated that they did not think it worth while! The tender was worth £21,000.

We could give other instances which have disgusted us at various times.

Britain First.

Australia.

Liability of Engineers.

A matter has come to my notice which is of more than mere interest to all steam users.

I have all my steam pipework insured, and I have lately received intimation from the Insurance Co. that although they still agree to insure it as it stands, they recommend the removal of all cast-iron. Our steam pressure is 160 lb., no superheat, the pipework is steel, and the valve bodies and separators are cast-iron.

I pointed out to the company that the wording in the latest Hopkinson valve catalogue which I have is "For 160 lb. pressure cast-iron bodies and covers," "For 225 lb. pressure cast-steel bodies and covers," but they still continue their "recommendation."

Now, in the event of an accident and Board of Trade inquiry, what is my position and that of all other engineers who have received such advice? Again, how far should the recommendation be carried? Should one include boiler fittings, such as safety valves, engine stop-valves, separators, high-pressure steam chests and cylinders?

Steam engineers should realise that, even though insured, they stand to be personally fined if negligence is brought home to them at a Board of Trade inquiry.

H. M. Taylor,
Borough Electrical Engineer.

Middlesbrough, *October 18th*, 1912.

Fuse Formulæ.

Various formulæ have been suggested from time to time relating the minimum current necessary to fuse a wire to the diameter of the wire. The best known is, perhaps, $C = a\,d^{3/2}$, where a is a constant.

Dr. Russell, also, in a paper read before the Physical Society some time ago ("The Convection of Heat from a Body Cooled by a Stream of Fluid"), deduces a result which gives $C \propto d^{1.25}$.

This formula Dr. Russell compares with experiments made by Schwartz and James, and gives a list of their results, showing that the index varied between 1·20 and 1·32 for certain wires of various substances. On referring to Schwartz and James's paper, I was somewhat surprised to find that the index varied widely for the same material. For instance, for copper, from 1 to 10 amperes, the index obtained was 1·195, whereas from 10 to 100 amperes the index was 1·403, for tin 1·13 to 1·32, and for aluminium 1·46 was obtained.

Dr. Russell, in deducing his formula, assumes, as is usual, a steady state existing between the gain and loss of heat, and also that the heat generated per second is proportional to $C^2 \rho_0/\pi a^2$, where ρ_0 is the volume resistivity (whatever that may mean), and a the radius.

The former of these assumptions is a fairly reasonable one under certain conditions, but why should $R = \rho_0/\pi a^2$? As regards many substances, R could never be arrived at in this

way even approximately, and it is a huge jump to assume it so.

Again, if we adopt Dr. Russell's formula for the cooling of a strip by convection, we ought to obtain a formula the fusing current for strips. Dr. Russell does not do this for some reason, but I have, and the results obtained do not agree with Schwartz and James's experiments.

For example, I get $c \propto b^{\frac{1}{2}} t^{\frac{1}{2}}$,

whereas Schwartz and James get—

$$c = A\, b\, (t + k) \text{ or } c = A\, t^{\frac{1}{4}} (b + k),$$

where b and t are breadth and thickness, A and k constants.

I have come to the conclusion that convection plays only a part in the phenomena of fusion of wires, &c., and I think that Dr. Russell was rather hard on electricians when he stated, "before this paper was published, electricians making the assumption that the heat emitted per unit surface was independent of its radius deduced that n should be 1·5."

I suggest that at present these poor people are not so far wrong after all, and that the index 1·5 is for some wires just about as unsuitable as 1·25.

W. H. F. Murdoch.

Millhill, Middlesex.
October 21st, 1912.

Generating Plant for Village Lighting.

I should like the advice of some of your readers as to what power to use for generating in the following circumstances:—I have charge of the generating station in a small village, with only 500 lights connected; this number is, however, steadily increasing. A small syndicate of local people owns the affair. As it was not easy to raise money for electric lighting in a little place like this, everything has been done in the most economical manner. There is at present only one engine, and this a steam engine. I believe the general opinion is that steam is out of the question in a case like this. Well, there is this to be considered. We can get good slack at 10s. per ton delivered. Our station is in a situation where smoke is no objection, and a brook of splendid water for the boiler runs through the premises. The engine and boiler are semi-portable, undertype, single cylinder, with governor acting on expansion valve, made by a first-class firm. It was bought, in perfect condition throughout, for a quarter of its cost new. With cold feed water, my fuel cost per unit sold is at present 1·1d. per unit (please don't laugh). Pressure only 65 lb., and non-condensing.

Supposing that only one engine can be afforded, should we be wise in changing over to gas or oil? I refer, of course, to suction gas and semi-Diesel oil engine, as the power required now is only 11 H.P., and will perhaps never exceed 20 H.P. The main question is as between low capital cost, high generating cost, and reliability on the part of steam, and (comparatively, being new engines) high capital cost, low fuel cost, and reliability, or unreliability on the other hand. Whatever steam may be called, we have never had a hitch, and the bogey of banking-up losses is not such a great one as might be imagined.

I don't know whether this letter is suitable for your paper, by the side of 30,000-H.P. turbines, &c., but I know that this small subject is of interest to many people, and through the advent of the metal-filament lamps these tiny stations in rural districts are going to multiply. And there are any amount of engines of the type mentioned going at almost scrap prices, although in perfect order.

A Little Man.

The Use of Mica in Electrical Apparatus.

With reference to the article by Messrs. Fleming and Johnson on the above subject, we should like to point out that the statement regarding the annealing of mica is not at all in accordance with our experience.

We would state that "silver mica" which we have placed on the market is almost entirely the product of a special annealing process. This material has for several years proved itself, in practical use, to be of extraordinary softness; it is used in very considerable quantities, and its use will lengthen the life of a commutator to an appreciable extent. Naturally, the process is one which requires the closest attention to achieve satisfactory results.

Silver mica has the same insulating properties as natural mica, and we have never noticed any tendency to disintegration; indeed, it has almost the same solidity as natural mica.

As regards price, there is also no considerable difference as compared with natural mica, especially as "Megohmit" (Micanite), sheets are made up in exactly the same way as with natural mica, thus enabling large sizes to be used at a minimum cost. Generally speaking, the material combines the advantages of natural mica with an otherwise unobtainable softness.

Further particulars are at the disposal of any of your readers interested.

Per pro **Meirowsky & Co., A.G.**
D. H. Schultz.

Manchester, *October 21st*, 1912.

Boiling Water.

I have carried out a test with a gas ring, in order to ascertain the cost of gas boiling, and give herewith the figures obtained, which should be useful to those who are improving the efficiency of electric boiling plates. Possibly someone would furnish particulars of a similar test with electricity:—Starting all cold (14° C.); volume of water, 2 pints measured; weight of kettle, 1¼ lb.; time to boil, 7½ minutes; gas used, 2·17 cb. ft.; cost at 1s. 11d. per thousand, ·05d.

The kettle has a copper bottom and sides, and also a small tube through the middle, which tube does not, however, increase the efficiency very much.

Electrician.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

The Hydro-Electric Power Commission, of Ontario, has just announced a substantial reduction in rates, to take effect on November 1st next. Of the more important towns, 17 are to benefit by amounts varying from about 3 per cent. to over 10 per cent.

The cheapest rate is £3 6s. 8d. for one horse-power-year, 24 hours per day, and the prices range up to £8 11s. For very small towns and villages very remote from the generating stations, the cost is higher still.

The chairman has announced that, after paying full interest charges to the Government (Provincial) amounting to some £30,000, there is still £10,000 left.

It is probable that next year further reductions will be made in the cost of energy, owing to the expected increase in the demand, which, by the end of the current month, will already have reached 30,000 H.P. This is an excellent result, considering that, with the exception of the few fairly large towns in Ontario, such as Toronto, Ottawa and Hamilton, all the rest of the towns are little larger than villages. Under the new rates Toronto's bill for power will be reduced from about £48,000 to £43,000 per annum. It was reported some time ago in these "Notes" that the Commission intended to act as a purchasing agent for the various municipalities. This work has now been actively taken up, and the Commission has been able to make contracts for large quantities of material on much better terms than would have been possible for the individual municipalities; better delivery is also secured, the Commission being a large, and, therefore, important buyer. Later on other advantages will be possible of attainment, as the Commission will have its own testing laboratory, and will be in a position to carry out suitable tests on lamps and other articles, so that, taking into consideration price, life and other factors, the municipalities will be able to buy materials of such a class as will best suit any particular requirements.

The Commission now also employs an auditor whose duty it is to investigate the financial standing of the electricity departments of the various towns. A standard system of accounting has been developed and is being widely adopted, weak spots in administration and business methods are brought to light, and the Commission recommends what it considers to be a suitable remedy.

It is evident that, particularly to the small towns and villages, such services as these are of immense benefit, as otherwise they must struggle on with inefficient plant, administration and unsatisfactory conditions generally, in many cases for years, as not a few of them have actually been doing.

Of course, as in the old country, municipalities here have a little way of overlooking such little items as depreciation and sinking fund, and go on merrily enough for a while. Now, however, the Commission is laying its finger on these matters, and it would be a bold Town Council that ignored the recommendations of the former body on such points.

Mr. Hamilton Wickes, the new Imperial Trade Commissioner, has arrived in this country, and is gathering information from all and sundry to enable him to deal with some of the problems which confront him. His task here will be somewhat different from what it was in Australia owing to the preponderating influence of the U.S.A. So far as the British manufacturer is concerned, electrical goods may be divided into two classes.

(*a*) Those in which American influence, as regards standards and patterns already ruling in the country, is very great.

(*b*) Those in which there are as yet in Canada no definitely accepted standards and patterns.

In class (*a*) come all those fittings and materials which are governed by the National Electric Code, such as conduit, small switches, fuses, insulation of wires and cables, &c. Extra-high-tension insulators, transformers, switchgear, &c., also come in this class, owing to the entire lack in Great Britain of any means of gaining practical experience of such apparatus—not until power is generated in bulk at the coal mines, and the Board of Trade permits overhead lines for 100,000 volts and more to be run across country, can the British manufacturer hope to enter the market for the latter.

In class (*b*) come central station plant, prime-movers, generators, motors, batteries, switchboards, instruments, electricity supply meters, and underground cables, especially for high voltages (say, 20,000 and upwards).

In class (*a*) it is not unlikely that American practice will always govern the situation, to a great extent, if not entirely, but in class (*b*) there is still hope for the British manufacturer, and the sooner he gets in the better, not only for himself, but also for Canada, as greater competition will be introduced and prices therefore kept down to a reasonable level.

Undoubtedly, the fact that in respect of the first-named materials in class (*a*) only Canadian and American firms are, practically speaking, in competition with each other, and that most of the former are closely affiliated with the latter, tends to keep up prices to an extent which would not be possible were other nations to enter the market.

There is a kind of double tariff wall in action here—*i.e.*, there is the ordinary Customs tariff on those materials, and on top, as it were, of that, comes the additional barrier due to the difficulty which firms outside of the American continent experience in getting their products approved by the Chicago laboratories; so far this has practically excluded competition in the lines of goods indicated from outside sources.

German Trading in Spain.—The number of dynamos, motors and transformers invoiced by the Madrid branch company of the Siemens-Schuckert Works in its first year of trading (1911) represented a total of 121,276 H.P. After defraying general expenses, interest on loans and taxes, and placing £5,000 to the depreciation account, the net profits are returned at £10,000. It is proposed to pay a dividend of 5 per cent. on the ordinary share capital of £180,000, and to carry forward the balance. The loan capital amounts to £60,000.

PROCEEDINGS OF INSTITUTIONS.

Sources of Energy Available for Power.

In the course of a Presidential Address by Dr. H. S. Hele-Shaw, F.R.S., M.Inst.C.E., before the Association of Engineers-in-Charge, on October 9th, the author reviewed the available sources from which power can be derived. Dealing first with coal, he stated that our present annual output was about 230,000,000 tons. Assuming the present rate of output to be maintained, our coal resources would last more than 400 years.

From data collected by Dr. Beilby, it was evident that there might be a possible saving of nearly one-third of the whole amount used. To the steam turbine we owed a considerable advance towards possible limits of thermal efficiency of the steam engine. The Hon. Sir Charles Parsons stated that the upper limit of temperature to which working was possible had been nearly reached, and remarked (report of the British Science Guild):—"The highest efficiency realised by any steam engine up to the present is about 12½ lb. of steam per KW.-hour, which is equivalent to 9 lb. per shaft horse-power, or a little over 1 lb. of good coal, or about ·85 lb. of oil burnt under a good boiler. This result has been obtained with units of 10,000 H.P. working at full load, with a steam pressure of 200 lb. gauge, superheated to a temperature of 300° C., and exhausting into a vacuum of 1 in. (absolute) of mercury. It represents a conversion of about 70 per cent. of the available energy of the steam into mechanical power, or a conversion of about one-fifth of the heat in the fuel into mechanical work." . . . "In practice, a temperature is soon reached beyond which the increased deterioration of the superheater, boiler and engines more than counterbalances the saving in fuel, so *that finality in this direction is soon reached, and, in fact, has already been nearly approached.* At the lower end of the cycle, the temperature of the condenser being determined by that of the circulating water, there is not much scope for improvement in this direction. There is, however, a probability of some improvement in boiler and engine efficiencies by the reduction of petty losses, which, in the aggregate, represent a loss nearly equal to the total energy realised as mechanical work. These losses are about equally divided between the boiler and the engine, and have for many years been the subject of much careful thought and investigation. The conclusion at present appears to be that the boiler and the steam engine may be improved to some considerable extent by small economic improvements in the method of combustion, in the efficiency of heat transfer in the boiler and superheater to the working fluid, and in the engine itself, *but that no further substantial improvement is possible in the condenser.*"

Coming next to the internal-combustion engine, Dr. Dugald Clerk remarked: "With regard to the future, it is possible in a large engine, *i.e.*, gas engine, to increase the indicated thermal efficiency to about 50 per cent., but in such an engine the mechanical efficiency obtained would be about 40 per cent. The smaller gas engines do not give quite such good results, but the falling off is not great." . . . . "A very large amount of power can still be obtained from the blast-furnace gases evolved at British ironworks. Assuming 10,000,000 tons of pig-iron to be made in Britain per annum, and allowing for the free gas available after heating the blast, about 700,000 H.P. could be continuously developed in Britain *without burning any additional fuel.* Some of this gas is used for motive power, but the greater part of it is still wasted. The gases evolved in modern coking processes can be collected and used for motive power. From this source it is possible in Britain to obtain about 140,000 H.P. continuously. Engineers are busily engaged at present in attempting to utilise all sources of motive power, and at no previous time have they paid greater attention to waste gases and waste heat than at present. The waste heat carried away in the exhaust gases of gas engines is utilised in many cases for raising steam, and about 2½ lb. of steam at over 100 lb. per sq. in. pressure can be obtained per hour per B.H.P. The exhaust steam, too, from rolling mill engines and other engines using little expansion, is being largely applied to operate low-pressure steam turbines. Practically all the waste heat from gas engines, amounting to about 50 per cent. of the total heat of combustion, could be utilised in some such manner."

Considering next the available supplies of petroleum for use as motive power, Dr. Sir Boverton Redwood stated that the quantity produced per annum all over the world was approximately 38,000,000 tons. "If the whole of this crude petroleum were employed as fuel in steam raising, it would not replace, allowing for its higher thermal efficiency, much more than 5 per cent. of the world's output of coal; whilst, if used in internal combustion engines, it would be equivalent, as a source of power, to about 15 per cent. of the coal. Only a small proportion, however, of the crude petroleum could be regarded as available for use as a source of power, for by far the larger part is in demand as an illuminating agent, and as a lubricant for machinery."

It was generally assumed that the power of both wind and water cost practically nothing. Quite apart, however, from the rental of the necessary land, the up-keep of wind and water mills was by no means a negligible quantity; but the really unsatisfactory feature of such power was its uncertainty and intermittent character. A good deal might be done to conserve the water power now running to waste in this country, but we could not hope to derive power from this source with an effect such as might be witnessed in other countries. At present tidal power could not compare with steam power, even putting the cost of coal against the rental of the necessary land in this country. Dr. Louis Bell, a few years ago, taking as an illustration the possibilities of the 40-ft. tides in the Bay of Fundy, showed that for two runs of 5 hours

each, more than 50,000 H.P. were available per sq. mile of reservoir, and that if the area between two head-lands 3 miles apart (an area of 400 sq. miles), could be converted into a tidal basin, more than 20,000,000 H.P. would be available: but to utilise it would require an engineering feat more tremendous than anything yet attempted by man. These figures, however, were interesting, as showing there were sources of power which, in the event of the exhaustion of our fuel supply, might at some future date have to be utilised.

Concerning the action of the wind, it took a fairly large windmill to produce any reasonable effect. For instance, a windmill with four sails, each 24 ft. long, and from 6 ft. to 9 ft. broad, making 16 R.P.M., and actuated by a fairly good wind having a velocity of 20 ft. per second, had as its highest theoretical effect only about 5 H.P.—that was to say, a windmill of this size would only produce the effect of a steam engine using from 10 to 15 lb. of coal per hour, or a total, in a week of 10 hours per day, somewhere about 5 cwt. The coal in question would only cost from 3s. to 4s., and the steam engine would have the enormous advantage of uniformity of effect, and this with a continuity of action which could not be ensured in the employment of the wind.

In countries like California, where the sunlight was continuous and rain occurred practically only at night, the direct rays of the sun might be considered to represent something like 10,000 H.P. available through at least eight hours of the day. Dr. Louis Bell gave an account of a recent type of apparatus for this purpose. The boiler gave 200 lb. pressure in full sunshine, and developed 10 H.P. The annual expense of this contrivance worked out at about £15 per horse-power per year, which was considerably below the cost of the power obtained from small steam or oil engines, and compared favourably with the price of electric power, at any rate in small units.

According to Sir William Ramsay, a ton of radium gave off energy which in the course of a year would be equivalent to the burning of 117 tons of coal. In doing this, it suffered only a minute loss of its weight. But, as far as could be reasonably conjectured, the whole world contained something like 5 cwt. of radium, so that if all the radium were available for power, and that power could be actually employed, this would only be equivalent to an annual supply of between 40 and 50 tons of coal. It was evident that our coal supply was the real source upon which we depended for mechanical power in this country, and it was a duty incumbent upon us all to economise as far as possible the stores of coal in the earth.

The Training of Engineers.

On October 12th an inaugural address was delivered to the Manchester Association of Engineers by the president, Mr. Chas. Day, Wh.Sc, from which we extract the following passages:—

In connection with the engineering trade I think it is possible so to arrange the conditions of employment for apprentices that all may have a reasonable chance of fitting themselves for advancement, and this without making the conduct of business unduly difficult. To put this into practical form I venture to outline a set of conditions under which apprentices might be employed:—

1. All apprentices to start on level terms, *i.e.*, no special privileges to be arranged in advance for any apprentice, either in regard to the number of departments he is allowed to work in, or in regard to his treatment whilst in those departments.

2. A certain proportion of the apprentices to be given a change of department, provided, of course, the conditions of trade allow of it; such apprentices to be selected from those who, by attendance at evening classes, have shown a desire to improve themselves and who, by good results at those classes, have shown satisfactory mental capacity and persistence. Satisfactory work in the shops should also be a condition.

By these means the capable and ambitious apprentices will obtain wider and more valuable training than those whose characteristics do not fit them for advancement, and the selection is almost automatically made by the apprentices themselves.

With a scheme of this kind, those who by their own want of effort limit their experience to one department of a works can, of course, only blame themselves if, at a later date they see that this narrowness of training and inattention to the theoretical side prevents them from advancing to higher positions.

It may be desirable to carry the scheme still further and provide that some of the most successful apprentices be given the full-day course at a technical school, or at least be given the opportunity to get it. In the Manchester district an intermediate step can be taken by utilising the apprentice course at the technical school, a course which is proving of distinct value. In this course apprentice engineers attend at the school each Monday during the winter session, the remaining working days being devoted to their usual employment with their evenings free for home work. The course is designed to extend over two years, but naturally employers should take care that any apprentice who does not take proper advantage of the first year, is displaced when the selection is made for the following year.

Though a high theoretical training is necessary for some positions, the number of such positions is comparatively small. What kind of education is then desirable for the employés of an engineering works?

In the case of many workmen we merely want manual skill combined with steadiness and attention to work, but in many cases, as, for instance, in the case of an erector, who is sent out to erect and set to work various kinds of machinery, a sufficient education is required to enable him to write a clear report, and in addition it is often desirable for him to have some knowledge of the basis principles connected with the machinery he is engaged upon.

For many workmen, and particularly for pattern-makers, the capacity to read drawings very thoroughly is essential.

A foreman in a machine shop does not require to be a mathematician or to have a deep knowledge of, say, the theory of heat, but he should know the elements of mechanics and a good deal about the various machine tools available, also he should have a knowledge of modern developments connected therewith.

In the case of draughtsmen, there is no doubt that technical education needs to be carried to a further degree, and in any works it is desirable that a few of the draughtsmen be men with advanced theoretical attainments so that special problems can be investigated and worked out.

The educational qualifications for managers and employers are very variable, depending largely on the class of work engaged upon, but a very sound training in first principles and in their application is a vital necessity to enable the probable effect of new developments to be gauged. Also it is very desirable for men in these positions to know what is going on in other branches of engineering, as it frequently happens that a troublesome new problem in one business has been dealt with and overcome years ago in another business; thus a fairly wide outlook on what has taken place in engineering is of special advantage.

For every different position in different works a different schedule of requirements might be made, but if this were done I feel sure that the number of positions for which high theoretical attainments are essential, or are even the principal factor, would be comparatively small, though those positions would be important ones. There is a substantial difference between a broad technical education and high theoretical attainments. An appreciation of this fact may encourage those whose circumstances do not enable them to acquire high theoretical attainments to realise that there are very many important positions open to them, for though scholastic training can help, and help greatly, it will never be so important as natural qualities.

A generation ago an apprentice in an engineering shop probably saw in that one shop a great variety of mechanical engineering work. To-day he most probably only sees one branch, or even only a sub-branch. This has the great disadvantage of narrowing the outlook of those so engaged. This narrowness can be overcome to a considerable degree by suitable training in a technical school or college which is equipped with a really good mechanical laboratory, as the student then sees and works upon a wide variety of modern machinery. Hence, a very important feature of a course of training at a well-equipped technical college lies in the wider outlook which results from seeing examples of many phases of engineering productivity, and of receiving explanations of their construction and action by teachers who are able to show how the first principles taught in the lecture-rooms are applied in practice. It is from this point of view that the extensive and varied lot of machinery in the engineering laboratories has much value.

Much which is called theoretical is really intensely practical, being the reduction to words of accumulated practical experience.

New inventions involve quite new lines of thought in their application, and men whose training has been in a narrow groove will probably be found quite unprepared (I do not say unfit) to cope with the new problems, or even to appreciate them. A good general technical training undoubtedly forms a better basis for dealing with entirely new problems than does a highly specialised one, and it makes men more disposed to watch new inventions and developments closely.

It is, then, a matter of importance for us to see that a sufficient proportion of our engineers receive a general technical training, and I would suggest that all engineering firms who do not at present assist or grant time to any of their apprentices to acquire such training, might consider the desirability of doing so to one or more of those apprentices who have already shown capacity.

From the foregoing notes it would appear that the technical education required for the different positions in engineering may be roughly graded as follows:—

(*a*) A grounding in the general basis principles underlying engineering work, combined with facility in reading drawings.

(*b*) A sound training in these same principles, together with a knowledge of their application in different branches of engineering, and a working knowledge of elementary mathematics.

(*c*) The same as "*b*," but with a more advanced knowledge of mathematics and of problems involving mathematics.

Every engineering apprentice who desires to rise at all must at least attain standard "*a*." Those who neglect to reach this standard practically decide for themselves their future positions. If attendance at evening classes can be followed by a course such as the apprentice course already mentioned, so much the better. After that, if facilities can be given for a picked few from each works to take a two or three years' full-day course, this would, I believe, be of distinct advantage not only to those apprentices, but to the trade of the country.

One point I would add, viz., that attendance at evening classes should not stop at the age of 21, and particularly so with those who have only been able to follow course "*a*," but opportunities should be taken to attend laboratories and special lectures.

Membership of this Association is the next natural step for young engineers in this district, for the work of the Association is undoubtedly of an educational character.

Another point worth remembering is that a man may have ability and still not rise if he does not let others see that he has such ability. Very many young men owe their first step upward to the fact that in discussions before such societies as this they have shown a clear insight into some engineering problem.

Most employers and managers have often to consider applications for employment from young men who have taken a course of training at a technical school or college, and who may have done

exceedingly well, but who desire to get to practical work. It is by no means easy to deal with this problem, as advanced theoretical training, though of great value in the higher positions already mentioned, is not of much value in the lower positions. In most mechanical engineering shops a start must be made at the bottom of the ladder just as ordinary apprentices. A young man leaving college should apply for a "job" in a workshop rather than, as he so often writes, "for a position where his training will be of value."

The Manchester Technical School is not only intended to be used for the training of youths and young men, but also as a centre for research and investigation. In this latter direction it is possible for the school to be of great benefit to the members of the Association; I should therefore like to see some closer co-operation between the two.

An effort is to be made at the Technical School to establish a really well-equipped laboratory for dealing fully with problems connected with the internal combustion engine, also for carrying out experiments in connection with aerial flight. More people are employed round Manchester in the manufacture of internal combustion engines than around any other centre in Great Britain.

At present there are fewer difficulties to be overcome in applying Diesel engines to marine propulsion than is the case with gas engines; hence it is natural that marine propulsion by internal combustion engines should be first developed with Diesel engines. All internal combustion engines suffer in one respect as compared with steam—viz., manœuvring power. As reversing has to be done by compressed air, a large air storage, or a separate compressing engine, is necessary, if the main engine is connected direct to the propeller shaft. Long periods of running at very low speeds must also be faced, and these speeds may be below the lowest speeds at which the engine can be run on oil or gas; hence the air storage or the independent compressing plant must be large enough to supply compressed air for this long period of running at slow speed. The alternative is not to connect the main engine direct to the propeller shaft, but to drive the propeller shaft through some form of clutch, or electrically. Mechanical clutches and reversing gears present considerable difficulty in large powers, though quite satisfactory in small powers.

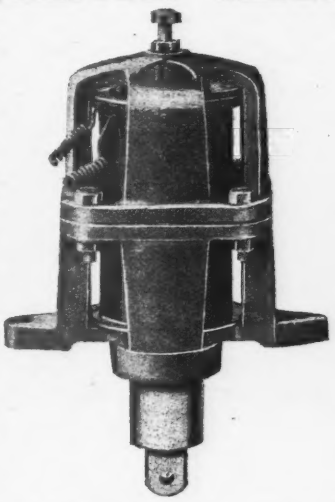


Fig. 2.—Ellison Brake Solenoid.

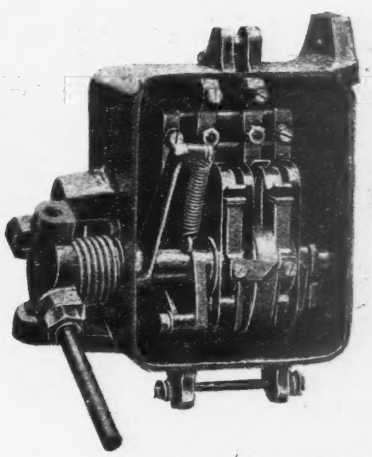


Fig. 3.—Ellison Limit Switch (Cover Removed).

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Arc Lamp Winch.

The London Electric Firm, of George Street, Croydon, have recently patented a winch for arc lamps and other light weights, having a ratio of one to one, *i.e.*, direct drive, which yet is self-sustaining both in raising and lowering. Where rapid lowering is desired, this can be supplied in place of their existing well-known pattern, which has a reduction gear as its base of operation. This new winch, like its predecessor, achieves its self-sustaining feature without ratchets, pawls, worm or gear wheels, springs or triggers. Fig. 1 shows the appearance of the winch.

Fig. 1.—Self-sustaining Winch with Direct Drive.

Brake Solenoids and Limit Switches.

The accompanying illustration, fig. 2, shows a type of solenoid made by Mr. George Ellison, of Victoria Works, Warstone Lane, Birmingham, for operating mechanical brakes on cranes, hoists, &c., or for other purposes where it is desired to exert a definite pull through a limited distance. The solenoid consists of two outer parts which form the yoke, in the centre of which is fitted a brass sleeve, acting as a guide for the plunger and a base for the windings of the coil, the latter being thoroughly insulated. The plunger acts as a piston working in an air dashpot, the effect of which is adjustable by means of a screw fitted on the top of the solenoid. The magnetic circuit is such that the apparatus is compact and very powerful. The stroke and pull can be arranged to meet requirements. The solenoids are designed for connection either across the line or in series with the motor, and for either crane or continuous rating.

Fig. 3 shows a limit switch designed for automatically limiting the travelling or lifting motions of cranes, lifts, hoists, &c. These are inserted in the main circuit between the controller and the motor, and interrupt the circuit just before the end of the travel, to prevent damage to crane or motor if the operator carelessly lets the crane run too far.

The switch closes automatically when the crane or crab runs in the opposite direction. The controller must be arranged so as to be able to travel backwards with the limit switch open. The limit switches are of the barrel type, single pole, and fitted with a strong magnetic blow-out for direct current, and double pole for A.C. A powerful spring is provided to ensure quick make-and-break action, which is independent of the operating lever. They are totally enclosed in a strong cast-iron case, with feet arranged for fixing the switch horizontally or vertically. The operating lever is a round steel rod screwed into one of the four bosses in the hub. All the four bosses are tapped, to enable the customer to fix the lever in the most convenient position. Pressed mica is used in the construction of the switch; no combustible or absorbent material is used.

The "I.F." Tip Controller Finger.

Messrs. Imeson & Finch, of Alma Chambers, Stockton-on-Tees, have introduced the tip finger which is illustrated in fig. 4, having an increased amount of wearing surface. The tip is countersunk at both sides, and can be reversed four times (by unscrewing the screw, which is securely fastened by means of a lock washer), thereby obtaining a very long life from the copper tip. The only wearing part is the tip, other parts remaining fixed to the controller. A great advantage of the "I.F." tip finger is the impossibility of buckling. The longer it is worn, the better the contact becomes. The copper tips can be replaced at a very small cost, being 50 per cent. less than replacing sliding contacts.

Electric Soldering and Branding Irons.

We have recently had an opportunity of inspecting the Vulcan soldering and branding irons, which are being put on the English market by Messrs. Scholey & Co., Ltd., of 151, Queen Victoria Street, E.C., and for which very high claims are made. The examples we saw are excellent with regard to workmanship, and there are many interesting details in the design which should have considerable influence on the lasting qualities and efficiency of the apparatus. Although the apparatus is new to the British market, there has been a sufficiently long experience of the Vulcan irons to warrant the claims that are made for them, and the records which have been put before us are remarkably good.

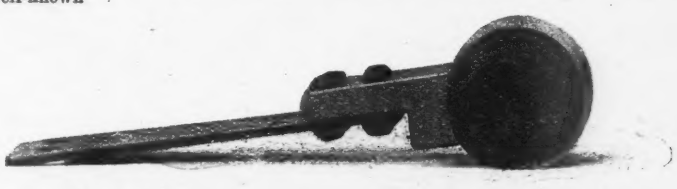


Fig. 4.—The "I.F." Tip Controller Finger.

Among the drawbacks hitherto urged against electric soldering irons are that they have been clumsy in construction and the heating element after a time gives considerable trouble, and very often burns out; these objections have been guarded against in the Vulcan tools by special methods; the heating unit, which is carried in the stem, is hermetically sealed, so that flux fumes cannot destroy it, and it is claimed that the peculiar construction forces the heat to the tip. The tip is made of pure copper, hand forged and tinned. The one-piece handle unscrews and slides back on the cord, exposing convenient terminals.

A complete range of irons has been designed, which shows a very considerable knowledge of the various operations in which

soldering is used. In fact, there would appear to be a sufficient variety of sizes to meet almost any industrial purpose. For instance, there is a special size for telephone and switchboard work and electrical instruments; another for motor-car repair and general use, and a larger pattern for heavy work. The weights vary from 12 to 65 ounces. Moreover, many of them are arranged in different shapes and lengths to meet various conditions. There are specially long ones for switchboard work, and specially short ones for linemen's work, and so on. The power consumption varies with the type and size of the instrument, from about

Fig. 5.—Vulcan Soldering Iron.

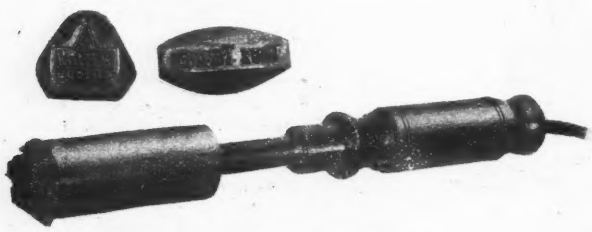


Fig. 6.—Vulcan Branding Tool.

50 watts in the smaller ones up to 500 watts for the largest size. The following figures, obtained from actual test, demonstrate the advantages of electricity over gas for soldering work. Gas is taken at 2s. per 1,000 cb. ft. and electricity at 1d. per unit, and the cost of operating equivalent irons for a 10-hour day is stated to be as follows:—

Electricity	·7	1·2	1·5	2·5	3·5
Gas	2·82	3·1	3·53	4·8	5·65

We think there is little doubt that these irons will be of great interest to all engaged in electrical work, and soldering operations in general.

We illustrate in fig. 5 a 29-oz. iron, suitable for general manufacturing purposes, and in fig. 6 a Vulcan branding tool, capable of branding up to 2 in. square, and heated in a similar way. Various special instruments for cautery, can-capping, &c., are also made.

A "Permanent Accumulator."

The Hagen Accumulator Works, of 15, Holborn Viaduct, E.C., have brought out what is styled a new "Permanent Accumulator;" that is, one which is constructed for very slow discharge extended over a long period. The cell consists of a round glass jar containing two cylindrical electrodes, the negative a thick rod and the positive a curved plate, with an insulating separator between them. The top of the cell is hermetically sealed, a perforated ebonite screwed plug being provided for filling the cell and allowing gas to escape, and the terminals are sheathed in ebonite.

Fig. 7.—Premier Aluminium Kettle.

The jar is of reddish brown glass, presumably to prevent injury by the action of light. These cells are designed to replace primary cells for telephone purposes, signalling and registering apparatus, and the like. The E.M.F. is 2 volts, and the accumulator can be kept for 12 months in the charged condition without deterioration. The output is half an ampere for 60 hours without intermission; the cell, which measures about 8¼ in. overall × 3½ in. diameter, is therefore very efficient for its size. It can, of course, be recharged in the usual way when run down.

Premier Electric Heating Devices.

Messrs. Premier Electric Heaters, Ltd., of Bradford Street, Birmingham, have placed on the market a cast-aluminium kettle specially designed for kitchen use, and shown in fig. 7. Although quite light, it is of considerable thickness, and suitable where rough usage is likely to be encountered. The heating elements are accommodated in the heat chamber on suitably cast surfaces, which are machined absolutely flat. Attachment is made by screws, so that replacements can very easily be effected when required. The outer bottom is also held in position by screws.

Its features are exceptional strength; no joints to leak; no solder

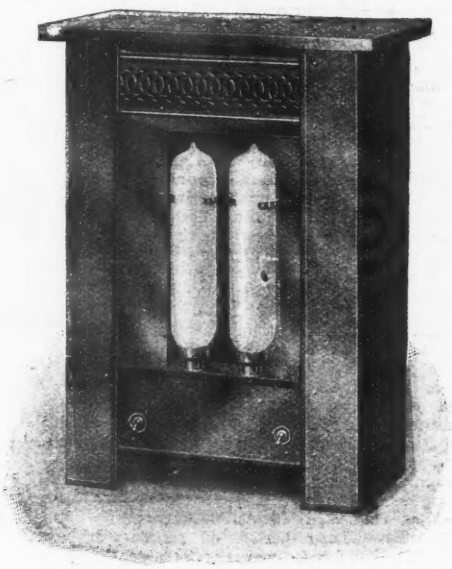


Fig. 8.—Premier Convector-Radiator.

whatever used in its construction; large rapid-pouring spout, which cannot get furred up with hard water; large lid and drop handle, allowing the interior to be easily and thoroughly cleaned out.

Fig. 8 shows another of the firm's specialties—a combined-type convector-radiator, having convector elements behind and two ordinary radiator lamps in front of a polished copper reflector. The convector elements are of the usual "Premier" type, consisting of wire spirals mounted on spirally grooved porcelain tubes, each element consuming 500 watts. The effect is pleasing, there being not too much glare, as the greater part of the current is dissipated by the convector elements, and the heating efficiency is high. The switches used are of ample capacity, and all other details have been carefully worked out.

Silvertown Searchlights.

The accompanying illustration shows a number of twin searchlight projectors, forming part of a repeat order that has recently

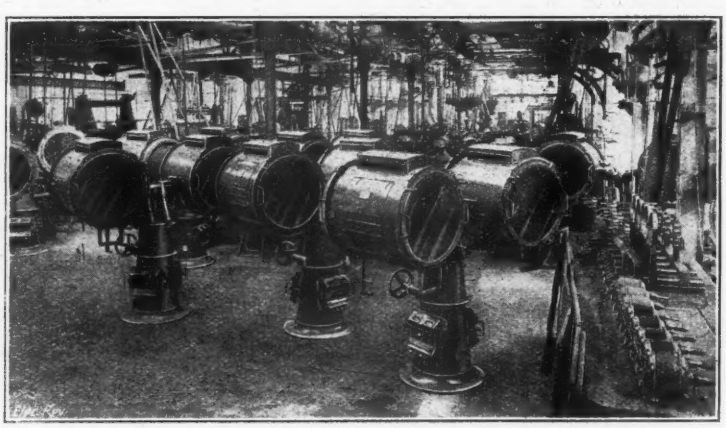


Fig. 9.—Silvertown Twin Searchlight Projectors.

been completed by the I.R., G.P. and T. Works Co., Ltd., at their works at Silvertown. The approximate height from the base to the centre of the barrel is 5 ft., each barrel being about 2 ft. in diameter, and fitted with independent hand-training and elevating gear.

The projectors are complete with double-pole switches, front glass doors and back mirror and frames, each separate part having been made at Silvertown.

The illustration also shows the automatic lamps and motors used

in conjunction with these projectors, the motors being used for elevating and training the barrels of the projectors.

Similar machines of a larger size, with double the diameter of barrel, are being made in another shop.

The India-Rubber Co. has of late years made a speciality of mechanical work in which the electrical portion forms but a small section, and it has in hand such interesting machinery as that required for washing and dyeing furs, making rock drills, train lighting sets, electro-hydraulic lifts, &c., besides machinery for wireless telegraphy.

Multiple Switch Automatic Starter.

The difficulties connected with the remote control of electric motors increase with the size of the motors. Experience has shown that the motor of over 50-H.P. capacity cannot be started automatically in a satisfactory manner, except by using separate switches to short-circuit each successive resistance step. In the past, apparatus designed to effect the above purpose has generally consisted of a number of separate solenoid main switches, which in turn are controlled by a sliding contact automatic control switch. The E.A.C. new patent automatic multiple switch starter eliminates both of these features, and hence it is considerably cheaper to manufacture. Each step is provided with a separate lever of knife-switch pattern, and each lever closes with a snap, and makes a certain and definite contact. The first contact, which in switching off is the last to break, is provided with a renewable carbon arcing tip. Only one solenoid is employed, which, when energised, slowly lifts the plunger against the dashpot. The cross bar, which is attached to the base of the plunger, lifts each lever in its turn, until the lever-controlling springs are moved over their dead centre, thus causing the levers to snap into their respective contacts, one at a time, and in their proper order.

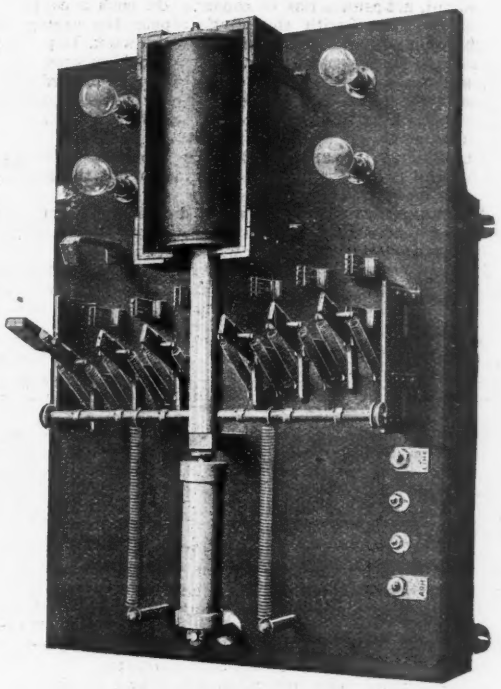


Fig. 10.—E.A.C. Multiple-Switch Automatic Starter.

When the motor has attained full speed, a high resistance is placed in series with the solenoid, to reduce the power consumption to a negligible value. The rate of cutting out resistance is adjustable, without affecting the quick make of the individual steps.

When the solenoid circuit is opened, the cross bar falls, instantaneously opening the switches in the reverse order, thus cutting the resistance in, and finally opening the motor circuit.

This starter is manufactured by the Electrical Apparatus Co., of Vauxhall Works, South Lambeth Road, S.W.

New Dimming Switch.

The "Twilight" patent reducing switch, which has been introduced by Messrs. Dimming Switches, Ltd., of Rea Street South, Birmingham, is a compact little resistance of the screw-down type, which affords a continuous variation, in the case of a lamp, from dull red to full brilliancy without sudden jumps; an electric fan or other apparatus taking a small current can be similarly regulated. A noteworthy feature is the fact that the switch has an "off" position, so that it is not an addition to, but a substitute for, the ordinary circuit switch. The construction of the device is ingenious, providing a simple means of adjustment of range to suit circumstances, and fig. 11 shows the external appearance of the switch.

LEGAL.

The National Telephone Arbitration.

(*Continued from page* 613.)

The contractors' profits were estimated by the Post Office at 1½ millions odd. Both sides agreed that the sum for material, including manufacturers' profit, freight, wages and all expenses of doing the work, should be 1¼ millions, but with the necessary additions the Post Office put the amount at £1,600,000, whereas the company said it should be £2,380,000.

Mr. J. F. C. Snell, of the firm of Preece, Cardew & Snell, consulting engineers, who, it will be remembered, gave evidence for the Post Office before the adjournment last July, was recalled for cross-examination by Sir A. Cripps.

In the course of some preliminary argument before the witness was questioned upon matters of supervision charges, &c., it appeared that the company had estimated the cost of work done under the head of conduits by contractors at £350,000, eliminating the element of profit. To this sum had to be added £150,000 for sub-contractor's supervision, making a total of £500,890. The contractor's profit under this head amounted to £50,000. The total for tools, wages, &c., paid by the contractors was put at £716,888.

Cross-examined, Witness said that the way in which the company had arrived at their figures for local engineering supervision and local administration charges was open to criticism. In some cases the charges for local administration were too high, and there was great difficulty in making a proper distinction between maintenance and capital accounts on the basis adopted by the company for preparing their figures. Another criticism he had to make was that charges for management, &c., were placed to construction, which ought properly to be considered as an element of cost in building up the business of the undertaking after the work of construction was completed.

Witness said, in answer to further questions by Sir Alfred Cripps, that assuming all the work to have been done by contract, 5 per cent. would cover the cost of engineering and management, no specific allowance being made for other management or for legal expenses. He based that figure on his own experience.

Fig. 11.—"Twilight" Dimming Switch.

Sir A. Cripps asked witness whether he meant that an undertaking costing, say, 10 millions to construct, could be carried out without the services of general management of the company apart from engineering supervision.

Witness said that the principle was the same as in smaller contracts. His company had carried out a large contract for the Government, covering dockyards all over the world, on the basis of 5 per cent., and were well paid.

Sir A. Cripps: Had the Admiralty no general management?

Sir Alfred then drew attention to several matters amounting to £440,000, on which witness, in his tables, had disallowed the usual 10 per cent. contractors' profits, on the ground that the work would have been done by the manufacturers who supplied the material, their worth being covered by the manufacturers' profits only.

Witness said it was the practice of cable manufacturers to lay cables, &c., without adding to their manufacturers' profits, and so he had disallowed the 10 per cent. on aerial cables, exchange equipment and subscribers' apparatus. He did not know how much of the work was done by the Post Office, nor did it in any way affect his tables, which were based on the experience of cable manufacturers.

Sir Alfred said that the calculations of the parties concerning the age of plant were so little apart that it might be convenient to postpone the part of the case dealing with depreciation for the

present, in order that both sides might confer on the subject with a view to saving time.

Sir J. Simon agreed to this course, and remarked that any agreement reached concerning the age of the plant might have the effect of facilitating an agreement upon the further subject of the "life" of the plant.

Earthenware pipes, Witness said, were but a small element in the company's plant. The physical life given for them in the company's figures was 80 years, and his witnesses' figures were 60 years. In regard to wrought-iron pipes, he had estimated their life at 17, as against the company's 35 years. The general experience of gas companies in regard to their service pipes, were that those constructed of wrought-iron had to be renewed about every 17 years.

Sir A. Cripps: Do you really mean that? Why, the gas companies would be always taking up the pavements!

Witness: I have had a great deal of experience of wrought-iron piping in connection with electrical work, and in some cases I have known such piping to rust away in three or four years, whilst, in other cases pipes have been as good as new after having been in the ground 11 years. It largely depends on the soil. I think 17 to 20 years is a fair average to take.

Cross-examined next on the life of telephone cables, Witness said that if they put on one side the diseases to which electrical cables were liable, the physical life of the lead-covered cables was about 50 years. Taking these diseases into consideration, that life was reduced to 40 years. The company had put the physical life of the same cables at 70 years.

Sir A. Cripps: Our equated life of these cables is estimated at 47¾ years. (To Witness) It seems to me that, if you eliminate the "diseases," such as electrolytic action, chemical action, and disturbance from outside causes, there is no reason why these cables should not last for ever.

Witness: Of course, if you eliminate the sources of attack, I suppose a lead-covered cable would last for an indefinite time; but the hypothesis is stupid.

But is it not a fact that the life of the cable is determined by the lead sheathing?—No; because it would be impossible to say what might take place in regard to the disintegration of paper in which the wires are wrapped.

Do you suggest that the paper insulation could enter into the question within a period of 50 years?—No; but I would not like to say that it would not become a factor for consideration in the 70 years' limit fixed by your figures.

In arriving at your estimate of the life of these cables, have you differentiated between the effects of electrolytic action, chemical action and outside disturbance—such as a hole being knocked in the cable?—No, certainly not.

Mr. G. H. Nisbett, member of the I.E.E., &c., and 18 years manager of the British Insulated and Helsby Cable Co., was called on behalf of the Post Office. The British Insulated, he said, was one of the large companies in the United Kingdom engaged in the manufacture and supply of electric cables The amount of telephone cable manufactured and supplied by his company during the past five years aggregated 60,000 miles of circuit per annum. They were the sole contractors for the Brighton, Glasgow and Portsmouth municipalities when they established their telephone systems.

Questioned about the way in which the estimates were prepared for the supply and laying of cables, Witness said his firm took out the prices at which they would sell cable after delivery on to the site. Having brought that into their estimate, they added to it the total estimated cost of the work they had to do. To that total cost was added 20 per cent. to cover standing charges incidental to local work, and then to that their profit as contractors. They did not charge contractors' profits where they were the manufacturers of the materials. The 20 per cent. included the whole of the undertaking; local and head office engineering charges, supervision of work, clerical local charges and clerical work at the head office. About 90 per cent. of the materials would not require storage, and he thought 1 per cent was ample for contingencies. He had seen the figures agreed to between the parties in regard to fundamental cost; they included manufacturers' profits so far as materials were concerned.

Cross-examined by Sir A. Cripps, Witness said his company had never acted for the Telephone Co., but they had supplied the Post Office with large quantities of material for a number of years.

In reply to Sir James Woodhouse, Witness said that they would turn out of their factory in 2½ years the number of miles of circuit required by the National Telephone Co.'s undertaking. This only applied to conduits and cables. The number of circuit miles of "pairs" required by the National Co.'s system, both underground and aerial, would be about 469,000.

Sir Alfred Cripps said the company's figure was 465,000 miles.

Continuing, Witness said he estimated that 1,200 men could carry out the work of drawing in, jointing and laying these cables in 2½ years.

Mr. Justice Lawrence: How do you arrive at your calculation?—Witness said he had taken the maximum quantity of cable, namely, 469,000 miles of pairs, which was nearly the company's figure. He had estimated that the average size of the cable was 100 "pairs," which gave a figure of 4,690 miles. Putting the number of joints at 20 per mile, there would be 93,800 joints. He calculated that one jointer would make only one joint per day—that was a generous allowance—so that in the result 133 jointers would take 120 weeks to complete the jointing work. To these figures he added 50 per cent. allowance for cutting the cable, fitting terminals, &c., which brought the number up to 200 jointers. With regard to drawing in the cables, 25 men would draw in 5 miles of cable per week, or 260 miles per year. That figure divided into 4,690 miles meant that 20 gangs of 25 men each would have to be employed; or, in other words, 200 men would complete this work in 2½ years. To these he had added 200 men for odd and incidental labour, which, together with the 200 jointers, 200 jointers' mates, and 100 for staff, totalled 900. In order to be on the safe side, he increased that figure to 1,200.

Mr. Danckwerts: That seems to ignore all the necessary difficulties. Witness said he had based his figures upon his general and expert knowledge of the business.

Cross-examined with regard to the supply of copper for the cables, Witness said it was a common thing for his company to place an order for 500 tons of electrolytic copper on the market without such order having any appreciable effect on the latter. Electrolytic copper was copper electrically refined for use in electrical work. Of the amount of copper changing hands each day on the market, one-third was electrolytic copper.

Sir A. Cripps said, in answer to Sir James Woodhouse, that the amount of electrolytic copper changing hands was about 1,000 tons per week.

Mr. Justice Lawrence: Do you mean the amount changing hands or the actual deliveries?—Sir Alfred said he was told that 1,000 tons a week was the actual consumption.—Witness: I should say it was in excess of that; 1,200 tons.

Continuing, Witness admitted that he had said on a previous occasion that the daily turnover of the copper market averaged 3,000 tons, and that large purchases for the purposes of such a contract as replacing the company's system would, if properly carried out, not cause a rise in copper. In such a contract they would be dealing with electrolytic copper, the average sale of which he did not put higher than 1,200 tons a week. In placing such large orders for copper on the market as would be necessary under such a contract, his firm would obtain warrants for ordinary commercial copper, and change them for electrolytic copper as they required it. That was a method commonly adopted in cases of large contracts.

Mr. Justice Lawrence: But the two kinds of copper are different prices?—Witness said that was so, but there was a fixed premium between the two.

Mr. Buckmaster: Are you prepared on behalf of your company to make a tender involving an obligation on your part to obtain 2,500 tons of electrolytic copper within a short period?

Sir A. Cripps objected to this question on the ground that the witness had already stated in the course of his evidence in reply to a similar question, that he could not answer it; it was a policy which his firm would have to consider.

Mr. Buckmaster (to witness): Would you have any difficulty in obtaining through the market the necessary amount of electrolytic copper for supplying and laying this quantity of cables within 2½ years?—I am sure we should not have the slightest difficulty.

Mr. Justice Lawrence: You mean it would not affect the market?—I could not answer that. I do not say it would not affect the market if we placed the order for the whole of the quantity required in one day, but I could cover my company against risk of rise in the price of the metal and subsequently obtain the necessary electrolytic copper.

In answer to further questions, Witness said the process of refining copper, or, in other words, of making electrolytic copper, was becoming more universal as time went on. There were at present two works in England engaged in the production of this material, but their combined output was relatively small compared with the total American output. He could not say what the total amount turned out in the United States came to.

Cross-examined with regard to his figures for scrap material, Witness said he ascertained the amount of material in the 68 centres of the company's system, and had calculated the value of the scrap copper at £68 a ton, and of the lead at £14 per ton. Having calculated the total value of the materials on the site, he deducted from that the cost of drawing out the cable from the conduits, which he put at 35 per cent. of the original cost of drawing it in. He had also deducted the cost of abstracting the metal from the scrap cable at 20s. per ton on the total weight of the cable, and another 25s. per ton had to be taken off to cover freight charges, &c.

Questioned next on the subject of corrosion of the lead sheathing of the cables, Witness said the length of new cable required to repair such a defect would depend entirely on how the cables were laid. If they were laid in a conduit, a fault caused by corrosion would entail the laying of a new piece of cable from one manhole to the next; but in the case of a cable simply laid underground, it would only be necessary to cut out the piece affected and renew it. He had had a considerable experience of the repairs necessary to electric cables after they had been laid, and he had found that such repairs certainly did not remain constant throughout the life of the cable.

Mr. Buckmaster: Do the difficulties with electric cables come from within or from without?

Witness: In electric power cables the difficulties may come both from within and from without.

Mr. Justice Lawrence: We have quite enough to do in this case to deal with telephone cables without going into questions affecting power cables.

Mr. Wm. Slingo, engineer-in-chief at the G.P.O., was next called, and gave evidence with regard to the plant possessed by the P.O. and the N.T. Co. Including both telegraph and telephone lines, he stated that the underground plant, single duct, belonging to the G.P.O. amounted to 5,728 miles, and that of the N.T.C. was 3,435 miles. The amount of underground cables, single wires, of the G.P.O. was 847,000 miles, and that of the N.T. Co., 827,000 miles. The G.P.O. owned 10,000 miles of submarine cables, and the N.T.C. 515 miles; the miles of pole routes of the G.P.O. were 53,105, and

that of the N.T.C. 17,831. The total mileage of bare wires and aerial cables of the Post Office was 458,600, and that of the N.T.C. 368,623. Witness next contrasted the expenditure at the engineering department in 1911-12 with the estimated expenditure for the current year, including the transfer of the N.T. Co.'s system as follows:—1911-12, £2,428,000; 1912-13, £4,233,000. The normal expenditure on telegraphs and telephones was £2,500,000. The supervision of the telephone engineering department was just as costly as that of the telegraph department.

(To be continued.)

Weber & Co., Ltd.

A petition presented by the County of London Electric Supply Co., Ltd., for the compulsory winding up of Weber & Co., Ltd., was before Mr. Justice Neville, in the Companies' Court, on Tuesday last.

Counsel stated that the petitioners were creditors. The company was in voluntary liquidation, and a meeting of creditors had been summoned for Saturday next. Under these circumstances, he suggested that the petition should stand over for a fortnight, to see what was done at the meeting.

The company assented, and his Lordship directed an adjournment accordingly.

Mooney *v.* Middleton Electric Traction Co.

On the 10th inst., at Oldham County Court, a case of importance to tramway employés was heard, in which James Mooney, a tramcar guard of Manchester New Road, Middleton, applied for compensation from the Middleton Electric Traction Co.

Mr. Clarke, solicitor, who represented the applicant, said Mooney was a guard employed by the company at a weekly wage of £1 4s. 6d. On May 6th he was acting as guard on a car running from Sudden to Middleton when something struck him in the eye. He continued working that day, and in the evening saw the company's medical adviser, Dr. Whitestone. The doctor advised him to go to the Manchester Eye Hospital. He went, and was asked to go into the hospital, but said he could not do so, as he had to support two sisters and a brother. Dr. Whitestone treated him for some time, and later he was treated by Dr. Harry, of Rochdale, but he had lost the sight of the eye. Mr. Clarke submitted that Mooney was exposed to an increased risk owing to the position in which he worked, the back of the car being exposed to dust and dirt, which flew around the car.

Mooney stated that he had been in the company's employ for 6½ years, and he thought a piece of grit struck him in the eye.

In the course of cross-examination by Mr. Acton, Dr. Harry said it was extremely likely that the eye could have been saved if Mooney had gone into the Eye Hospital on May 10th.

For the respondents, Mr. Acton submitted that the statutory notice was not served as soon as practicable under the Act.

His Honour agreed with this view, and, in giving judgment for the respondents, said he was always loath to decide a compensation case on that point, but he was bound to do so.

Fraudulently Abstracting Electricity.

Mrs. Louisa Brinckworth, of 17, Herbert Street, Taunton, was charged at Taunton Police Court on the 16th inst. with having wilfully or fraudulently abstracted electricity from the mains of the Taunton Town Council, on September 17th and 18th.

The Town Clerk said defendant's house was supplied with electric light some years ago, and for some time past the defendant's winter consumption was about half that of the summer. The meter inspector visited the house a week earlier than the usual time, and he found that the electric light main had been so tampered with that the current was scarcely going through the meter at all. By the method adopted, electricity could be used without any payment.

Mr. A. J. Howard, Corporation electrical engineer, said the effect of the contrivance of the defendant would be that practically all the current would go through the "bridge" and not through the meter. The defendant's statement, on oath, was that she recently had her house redecorated, and as the painters complained that the loose electric light wires were in the way, and would scratch the paint of the door, she fastened them back with a bit of wire, which her little girl found. She did not use the electric light much, as she had oil lamps. She did not know anything about electricity, and did not understand how to make a contact.

The Magistrates, after hearing evidence on behalf of the defendant, told her she had wronged the owners of the light, and people must understand that they could not tamper with these things. She would be fined 10s. and costs.

British Westinghouse Electric Co. *v.* the Underground Electric Railways, Ltd.

A Divisional Court of the King's Bench Division, consisting of the Lord Chief Justice and Justices Channell and Avory, on Tuesday heard a motion in connection with this litigation, which was recently before the House of Lords.

Sir Alfred Cripps, K.C., and Mr. Disturnal appeared for the British Westinghouse Co., while Mr. Fitzgerald, K.C., was for the defendants.

Mr. Disturnal informed the Court that the first part of the motion would not be objected to, and that was that their Lordships should make as an order of the Court the finding of the House of Lords recently delivered. The other part of the motion would be opposed, and that was that an order should be made for the repayment to his clients of certain sums amounting to about £26,000, which they had paid to the Underground Electric Co. by order of the Court.

The Lord Chief Justice: Are you asking for the payment out of that money now?

Mr. Disturnal: Yes. Their Lordships would remember that the Westinghouse Co. claimed £87,000 for machinery supplied to the Underground Railways Co., while the latter counter-claimed for £78,000, alleging that the machines were not up to contract. The matter had been before an arbitrator, the Divisional Court, the Court of Appeal, and the House of Lords. The arbitrator made an award by which the Underground Co. were to receive £15,000 from the Westinghouse people, and that was paid together with a large amount of costs. Since then the Law Lords had decided that that matter should go back to the Arbitrator with a fresh direction, and he applied that having regard to that finding of the House of Lords, the applicants should be repaid the sums they had paid out.

Mr. Fitzgerald objected on behalf of the Underground Railways. He said his contention was that the Court had no jurisdiction to order the repayment of the money, seeing that the matter was not at an end, and the Arbitrator might not alter his award by sixpence.

Mr. Fitzgerald was continuing his argument on Wednesday morning, when the Lord Chief Justice said he now understood that there had been an order of the Court with regard to the matter, and therefore they had jurisdiction to deal with the whole of the motion.

Mr. Fitzgerald said that was simply an order which enabled execution to be issued to enforce the award if necessary. It was not a judgment or order for the payment of the amount awarded. At the same time, his clients would be willing to pay out the amount if the solicitors for the other side would give an undertaking to pay it back again if the award was not altered.

Mr. Disturnal said he agreed that they could not claim interest on the amount to date, but directly the Court made the order they could claim interest, and that would amount to a good sum.

The Court granted the application, making the judgment of the House of Lords an order of the High Court, and ordering the repayment to the Westinghouse Co. of sums amounting to £16,500 by the Underground Railways, Ltd.

Attorney-General *v.* London Electric Railways Co.

The motion in this action, which was before the Judge in the Vacation, and by which it was sought to restrain pumping at the defendants' Embankment Station in alleged contravention of the Act of Parliament was, on Friday last, with the consent of all parties, fixed to come before Mr. Justice Neville in the Chancery Division to-day, 25th inst.

Electric Steel Works on Tyneside.—A new industry, that of steel melting by electricity, is about to be started at Dunston-on-Tyne by the Stobie Steel Co., of Sheffield. The chief reason why the works are to be established in that neighbourhood is that any quantity of electricity can be obtained at a price which can be quoted by few generating companies. Dunston, although situated on the upper reaches of the Tyne, is admirably situated, for there is an immense shipping trade, and there are several engineering works in close proximity. The site obtained by the Stobie Co. is very favourably situated; it is near the Dunston generating station of the Newcastle Electric Supply Co., whence the current will be derived, and but a short distance from both river and railway. The installation which at present it is intended to put down consists of a 15-ton three-phase steel-melting furnace and a 5-ton two-phase furnace for special steels, and a 3-cwt. alloy-melting furnace. It is stated that the Dunston works will be the first in Great Britain solely engaged in the manufacture of tool steel, alloy steels, &c., by electricity. Our correspondent understands that the establishment of armour-plate works on Teeside is being considered by a south-country syndicate.

The site of the new works covers an area of three acres, and the laying out of the ground and erection of furnaces and buildings will occupy about six months; it is expected to begin actual operations next spring. Mr. Victor Stobie first introduced the present process into Sheffield, and a feature of the Dunston installation is that every part of it is of his design. The output is expected to be 33,000 tons per year. The steel ingots which the company will manufacture at Dunston will be sent to Sheffield to work into bars and forgings, but it is expected that the cost of transit will be more than balanced by the low rates and the cheap charges for electrical energy.

Fair Wages Clauses.—The Edinburgh Building Trades' Federation and the Electrical Contractors' Association complain that the Corporation fair wages clause in contracts is inquisitorial and oppressive, as a contractor is held to have given assurance that for a period of three months prior to the contract he has paid the standard rate of wages, and the Corporation has power to examine the books of a contractor in the event of a dispute arising as to wages paid. A Sub-Committee of the Town Council recommends the Council to adhere to the present form of the clause.

present, in order that both sides might confer on the subject with a view to saving time.

Sir J. Simon agreed to this course, and remarked that any agreement reached concerning the age of the plant might have the effect of facilitating an agreement upon the further subject of the "life" of the plant.

Earthenware pipes, Witness said, were but a small element in the company's plant. The physical life given for them in the company's figures was 80 years, and his witnesses' figures were 60 years. In regard to wrought-iron pipes, he had estimated their life at 17, as against the company's 35 years. The general experience of gas companies in regard to their service pipes, were that those constructed of wrought-iron had to be renewed about every 17 years.

Sir A. Cripps: Do you really mean that? Why, the gas companies would be always taking up the pavements!

Witness: I have had a great deal of experience of wrought-iron piping in connection with electrical work, and in some cases I have known such piping to rust away in three or four years, whilst, in other cases pipes have been as good as new after having been in the ground 11 years. It largely depends on the soil. I think 17 to 20 years is a fair average to take.

Cross-examined next on the life of telephone cables, Witness said that if they put on one side the diseases to which electrical cables were liable, the physical life of the lead-covered cables was about 50 years. Taking these diseases into consideration, that life was reduced to 40 years. The company had put the physical life of the same cables at 70 years.

Sir A. Cripps: Our equated life of these cables is estimated at 47¾ years. (To Witness) It seems to me that, if you eliminate the "diseases," such as electrolytic action, chemical action, and disturbance from outside causes, there is no reason why these cables should not last for ever.

Witness: Of course, if you eliminate the sources of attack, I suppose a lead-covered cable would last for an indefinite time; but the hypothesis is stupid.

But is it not a fact that the life of the cable is determined by the lead sheathing?—No; because it would be impossible to say what might take place in regard to the disintegration of paper in which the wires are wrapped.

Do you suggest that the paper insulation could enter into the question within a period of 50 years?—No; but I would not like to say that it would not become a factor for consideration in the 70 years' limit fixed by your figures.

In arriving at your estimate of the life of these cables, have you differentiated between the effects of electrolytic action, chemical action and outside disturbance—such as a hole being knocked in the cable?—No, certainly not.

Mr. G. H. Nisbett, member of the I.E.E., &c., and 18 years manager of the British Insulated and Helsby Cable Co., was called on behalf of the Post Office. The British Insulated, he said, was one of the large companies in the United Kingdom engaged in the manufacture and supply of electric cables The amount of telephone cable manufactured and supplied by his company during the past five years aggregated 60,000 miles of circuit per annum. They were the sole contractors for the Brighton, Glasgow and Portsmouth municipalities when they established their telephone systems.

Questioned about the way in which the estimates were prepared for the supply and laying of cables, Witness said his firm took out the prices at which they would sell cable after delivery on to the site. Having brought that into their estimate, they added to it the total estimated cost of the work they had to do. To that total cost was added 20 per cent. to cover standing charges incidental to local work, and then to that their profit as contractors. They did not charge contractors' profits where they were the manufacturers of the materials. The 20 per cent. included the whole of the undertaking; local and head office engineering charges, supervision of work, clerical local charges and clerical work at the head office. About 90 per cent. of the materials would not require storage, and he thought 1 per cent was ample for contingencies. He had seen the figures agreed to between the parties in regard to fundamental cost; they included manufacturers' profits so far as materials were concerned.

Cross-examined by Sir A. Cripps, Witness said his company had never acted for the Telephone Co., but they had supplied the Post Office with large quantities of material for a number of years.

In reply to Sir James Woodhouse, Witness said that they would turn out of their factory in 2½ years the number of miles of circuit required by the National Telephone Co.'s undertaking. This only applied to conduits and cables. The number of circuit miles of "pairs" required by the National Co.'s system, both underground and aerial, would be about 469,000.

Sir Alfred Cripps said the company's figure was 465,000 miles.

Continuing, Witness said he estimated that 1,200 men could carry out the work of drawing in, jointing and laying these cables in 2½ years.

Mr. Justice Lawrence: How do you arrive at your calculation?—Witness said he had taken the maximum quantity of cable, namely, 469,000 miles of pairs, which was nearly the company's figure. He had estimated that the average size of the cable was 100 "pairs," which gave a figure of 4,690 miles. Putting the number of joints at 20 per mile, there would be 93,800 joints. He calculated that one jointer would make only one joint per day—that was a generous allowance—so that in the result 133 jointers would take 120 weeks to complete the jointing work. To these figures he added 50 per cent. allowance for cutting the cable, fitting terminals, &c., which brought the number up to 200 jointers. With regard to drawing in the cables, 25 men would draw in 5 miles of cable per week, or 260 miles per year. That figure divided into 4,690 miles meant that 20 gangs of 25 men each would have to be employed; or, in other words, 200 men would complete this work in 2½ years. To these he had added 200 men for odd and incidental labour, which, together with the 200 jointers, 200 jointers' mates, and 100 for staff, totalled 900. In order to be on the safe side, he increased that figure to 1,200.

Mr. Danckwerts: That seems to ignore all the necessary difficulties. Witness said he had based his figures upon his general and expert knowledge of the business.

Cross-examined with regard to the supply of copper for the cables, Witness said it was a common thing for his company to place an order for 500 tons of electrolytic copper on the market without such order having any appreciable effect on the latter. Electrolytic copper was copper electrically refined for use in electrical work. Of the amount of copper changing hands each day on the market, one-third was electrolytic copper.

Sir A. Cripps said, in answer to Sir James Woodhouse, that the amount of electrolytic copper changing hands was about 1,000 tons per week.

Mr. Justice Lawrence: Do you mean the amount changing hands or the actual deliveries?—Sir Alfred said he was told that 1,000 tons a week was the actual consumption.—Witness: I should say it was in excess of that; 1,200 tons.

Continuing, Witness admitted that he had said on a previous occasion that the daily turnover of the copper market averaged 3,000 tons, and that large purchases for the purposes of such a contract as replacing the company's system would, if properly carried out, not cause a rise in copper. In such a contract they would be dealing with electrolytic copper, the average sale of which he did not put higher than 1,200 tons a week. In placing such large orders for copper on the market as would be necessary under such a contract, his firm would obtain warrants for ordinary commercial copper, and change them for electrolytic copper as they required it. That was a method commonly adopted in cases of large contracts.

Mr. Justice Lawrence: But the two kinds of copper are different prices?—Witness said that was so, but there was a fixed premium between the two.

Mr. Buckmaster: Are you prepared on behalf of your company to make a tender involving an obligation on your part to obtain 2,500 tons of electrolytic copper within a short period?

Sir A. Cripps objected to this question on the ground that the witness had already stated in the course of his evidence in reply to a similar question, that he could not answer it; it was a policy which his firm would have to consider.

Mr. Buckmaster (to witness): Would you have any difficulty in obtaining through the market the necessary amount of electrolytic copper for supplying and laying this quantity of cables within 2½ years?—I am sure we should not have the slightest difficulty.

Mr. Justice Lawrence: You mean it would not affect the market?—I could not answer that. I do not say it would not affect the market if we placed the order for the whole of the quantity required in one day, but I could cover my company against risk of rise in the price of the metal and subsequently obtain the necessary electrolytic copper.

In answer to further questions, Witness said the process of refining copper, or, in other words, of making electrolytic copper, was becoming more universal as time went on. There were at present two works in England engaged in the production of this material, but their combined output was relatively small compared with the total American output. He could not say what the total amount turned out in the United States came to.

Cross-examined with regard to his figures for scrap material, Witness said he ascertained the amount of material in the 68 centres of the company's system, and had calculated the value of the scrap copper at £68 a ton, and of the lead at £14 per ton. Having calculated the total value of the materials on the site, he deducted from that the cost of drawing out the cable from the conduits, which he put at 35 per cent. of the original cost of drawing it in. He had also deducted the cost of abstracting the metal from the scrap cable at 20s. per ton on the total weight of the cable, and another 25s. per ton had to be taken off to cover freight charges, &c.

Questioned next on the subject of corrosion of the lead sheathing of the cables, Witness said the length of new cable required to repair such a defect would depend entirely on how the cables were laid. If they were laid in a conduit, a fault caused by corrosion would entail the laying of a new piece of cable from one manhole to the next; but in the case of a cable simply laid underground, it would only be necessary to cut out the piece affected and renew it. He had had a considerable experience of the repairs necessary to electric cables after they had been laid, and he had found that such repairs certainly did not remain constant throughout the life of the cable.

Mr. Buckmaster: Do the difficulties with electric cables come from within or from without?

Witness: In electric power cables the difficulties may come both from within and from without.

Mr. Justice Lawrence: We have quite enough to do in this case to deal with telephone cables without going into questions affecting power cables.

Mr. Wm. Slingo, engineer-in-chief at the G.P.O., was next called, and gave evidence with regard to the plant possessed by the P.O. and the N.T. Co. Including both telegraph and telephone lines, he stated that the underground plant, single duct, belonging to the G.P.O. amounted to 5,728 miles, and that of the N.T.C. was 3,435 miles. The amount of underground cables, single wires, of the G.P.O. was 847,000 miles, and that of the N.T. Co., 827,000 miles. The G.P.O. owned 10,000 miles of submarine cables, and the N.T.C. 515 miles; the miles of pole routes of the G.P.O. were 53,105, and

that of the N.T.C. 17,831. The total mileage of bare wires and aerial cables of the Post Office was 458,600, and that of the N.T.C. 368,623. Witness next contrasted the expenditure at the engineering department in 1911-12 with the estimated expenditure for the current year, including the transfer of the N.T. Co.'s system as follows:—1911-12, £2,428,000; 1912-13, £4,233,000. The normal expenditure on telegraphs and telephones was £2,500,000. The supervision of the telephone engineering department was just as costly as that of the telegraph department.

(To be continued.)

Weber & Co., Ltd.

A petition presented by the County of London Electric Supply Co., Ltd., for the compulsory winding up of Weber & Co., Ltd., was before Mr. Justice Neville, in the Companies' Court, on Tuesday last.

Counsel stated that the petitioners were creditors. The company was in voluntary liquidation, and a meeting of creditors had been summoned for Saturday next. Under these circumstances, he suggested that the petition should stand over for a fortnight, to see what was done at the meeting.

The company assented, and his Lordship directed an adjournment accordingly.

Mooney *v.* Middleton Electric Traction Co.

On the 10th inst., at Oldham County Court, a case of importance to tramway employés was heard, in which James Mooney, a tramcar guard of Manchester New Road, Middleton, applied for compensation from the Middleton Electric Traction Co.

Mr. Clarke, solicitor, who represented the applicant, said Mooney was a guard employed by the company at a weekly wage of £1 4s. 6d. On May 6th he was acting as guard on a car running from Sudden to Middleton when something struck him in the eye. He continued working that day, and in the evening saw the company's medical adviser, Dr. Whitestone. The doctor advised him to go to the Manchester Eye Hospital. He went, and was asked to go into the hospital, but said he could not do so, as he had to support two sisters and a brother. Dr. Whitestone treated him for some time, and later he was treated by Dr. Harry, of Rochdale, but he had lost the sight of the eye. Mr. Clarke submitted that Mooney was exposed to an increased risk owing to the position in which he worked, the back of the car being exposed to dust and dirt, which flew around the car.

Mooney stated that he had been in the company's employ for 6½ years, and he thought a piece of grit struck him in the eye.

In the course of cross-examination by Mr. Acton, Dr. Harry said it was extremely likely that the eye could have been saved if Mooney had gone into the Eye Hospital on May 10th.

For the respondents, Mr. Acton submitted that the statutory notice was not served as soon as practicable under the Act.

His Honour agreed with this view, and, in giving judgment for the respondents, said he was always loath to decide a compensation case on that point, but he was bound to do so.

Fraudulently Abstracting Electricity.

Mrs. Louisa Brinckworth, of 17, Herbert Street, Taunton, was charged at Taunton Police Court on the 16th inst. with having wilfully or fraudulently abstracted electricity from the mains of the Taunton Town Council, on September 17th and 18th.

The Town Clerk said defendant's house was supplied with electric light some years ago, and for some time past the defendant's winter consumption was about half that of the summer. The meter inspector visited the house a week earlier than the usual time, and he found that the electric light main had been so tampered with that the current was scarcely going through the meter at all. By the method adopted, electricity could be used without any payment.

Mr. A. J. Howard, Corporation electrical engineer, said the effect of the contrivance of the defendant would be that practically all the current would go through the "bridge" and not through the meter. The defendant's statement, on oath, was that she recently had her house redecorated, and as the painters complained that the loose electric light wires were in the way, and would scratch the paint of the door, she fastened them back with a bit of wire, which her little girl found. She did not use the electric light much, as she had oil lamps. She did not know anything about electricity, and did not understand how to make a contact.

The Magistrates, after hearing evidence on behalf of the defendant, told her she had wronged the owners of the light, and people must understand that they could not tamper with these things. She would be fined 10s. and costs.

British Westinghouse Electric Co. *v.* the Underground Electric Railways, Ltd.

A Divisional Court of the King's Bench Division, consisting of the Lord Chief Justice and Justices Channell and Avory, on Tuesday heard a motion in connection with this litigation, which was recently before the House of Lords.

Sir Alfred Cripps, K.C., and Mr. Disturnal appeared for the British Westinghouse Co., while Mr. Fitzgerald, K.C., was for the defendants.

Mr. Disturnal informed the Court that the first part of the motion would not be objected to, and that was that their Lordships should make as an order of the Court the finding of the House of Lords recently delivered. The other part of the motion would be opposed, and that was that an order should be made for the repayment to his clients of certain sums amounting to about £26,000, which they had paid to the Underground Electric Co. by order of the Court.

The Lord Chief Justice: Are you asking for the payment out of that money now?

Mr. Disturnal: Yes. Their Lordships would remember that the Westinghouse Co. claimed £87,000 for machinery supplied to the Underground Railways Co., while the latter counter-claimed for £78,000, alleging that the machines were not up to contract. The matter had been before an arbitrator, the Divisional Court, the Court of Appeal, and the House of Lords. The arbitrator made an award by which the Underground Co. were to receive £15,000 from the Westinghouse people, and that was paid together with a large amount of costs. Since then the Law Lords had decided that that matter should go back to the Arbitrator with a fresh direction, and he applied that having regard to that finding of the House of Lords, the applicants should be repaid the sums they had paid out.

Mr. Fitzgerald objected on behalf of the Underground Railways. He said his contention was that the Court had no jurisdiction to order the repayment of the money, seeing that the matter was not at an end, and the Arbitrator might not alter his award by sixpence.

Mr. Fitzgerald was continuing his argument on Wednesday morning, when the Lord Chief Justice said he now understood that there had been an order of the Court with regard to the matter, and therefore they had jurisdiction to deal with the whole of the motion.

Mr. Fitzgerald said that was simply an order which enabled execution to be issued to enforce the award if necessary. It was not a judgment or order for the payment of the amount awarded. At the same time, his clients would be willing to pay out the amount if the solicitors for the other side would give an undertaking to pay it back again if the award was not altered.

Mr. Disturnal said he agreed that they could not claim interest on the amount to date, but directly the Court made the order they could claim interest, and that would amount to a good sum.

The Court granted the application, making the judgment of the House of Lords an order of the High Court, and ordering the repayment to the Westinghouse Co. of sums amounting to £16,500 by the Underground Railways, Ltd.

Attorney-General *v.* London Electric Railways Co.

The motion in this action, which was before the Judge in the Vacation, and by which it was sought to restrain pumping at the defendants' Embankment Station in alleged contravention of the Act of Parliament was, on Friday last, with the consent of all parties, fixed to come before Mr. Justice Neville in the Chancery Division to-day, 25th inst.

Electric Steel Works on Tyneside.—A new industry, that of steel melting by electricity, is about to be started at Dunston-on-Tyne by the Stobie Steel Co., of Sheffield. The chief reason why the works are to be established in that neighbourhood is that any quantity of electricity can be obtained at a price which can be quoted by few generating companies. Dunston, although situated on the upper reaches of the Tyne, is admirably situated, for there is an immense shipping trade, and there are several engineering works in close proximity. The site obtained by the Stobie Co. is very favourably situated; it is near the Dunston generating station of the Newcastle Electric Supply Co., whence the current will be derived, and but a short distance from both river and railway. The installation which at present it is intended to put down consists of a 15-ton three-phase steel-melting furnace and a 5-ton two-phase furnace for special steels, and a 3-cwt. alloy-melting furnace. It is stated that the Dunston works will be the first in Great Britain solely engaged in the manufacture of tool steel, alloy steels, &c., by electricity. Our correspondent understands that the establishment of armour-plate works on Teeside is being considered by a south-country syndicate.

The site of the new works covers an area of three acres, and the laying out of the ground and erection of furnaces and buildings will occupy about six months; it is expected to begin actual operations next spring. Mr. Victor Stobie first introduced the present process into Sheffield, and a feature of the Dunston installation is that every part of it is of his design. The output is expected to be 33,000 tons per year. The steel ingots which the company will manufacture at Dunston will be sent to Sheffield to work into bars and forgings, but it is expected that the cost of transit will be more than balanced by the low rates and the cheap charges for electrical energy.

Fair Wages Clauses.—The Edinburgh Building Trades' Federation and the Electrical Contractors' Association complain that the Corporation fair wages clause in contracts is inquisitorial and oppressive, as a contractor is held to have given assurance that for a period of three months prior to the contract he has paid the standard rate of wages, and the Corporation has power to examine the books of a contractor in the event of a dispute arising as to wages paid. A Sub-Committee of the Town Council recommends the Council to adhere to the present form of the clause.

NEW FITTINGS SHOWROOMS.

A year or two ago we referred here to the series of new showrooms that had been opened by Messrs. Falk, Stadelmann & Co., Ltd., at their premises at 83-87, Farringdon Road, London. E.C., for the display, amid suitable surroundings, of various designs of electric light fittings. We have this week inspected a further, and equally extensive, suite of apartments, decorated and furnished in styles characteristic of the Louis and contemporary English periods, that have just been made in the same buildings. These consist of Jacobean and French rooms. The former is fitted out in oak and, among other features, contains a magnificent fireplace with luminous

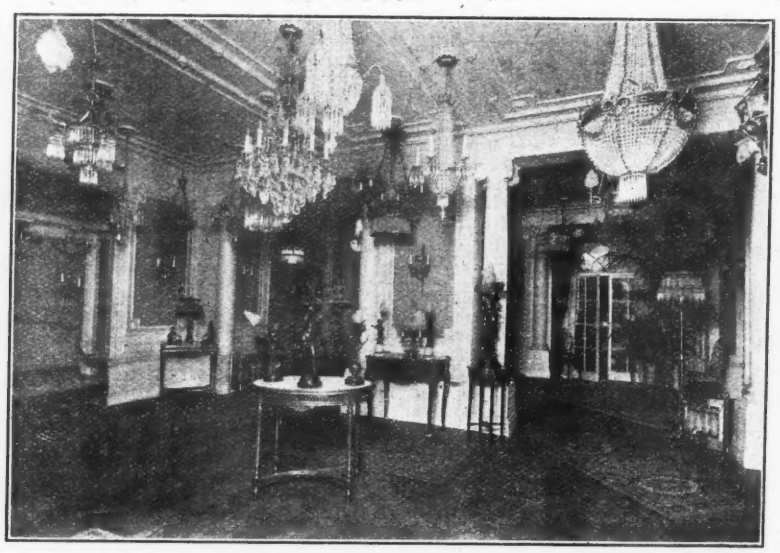


Fig. 1.—The French Room at, Falk, Stadelmann's

Fig. 2.—Messrs. Falk, Stadelmann's New Jacobean Showroom.

radiator. It is illustrated in fig. 2, from which the reader will observe that there is a fine selection of excellent models of the Georgian period, in the centre of which is a good example of Flemish candle electrolier fitting. In the brackets, pendants, standard and other fittings shown here, there is included every kind of finish. The other apartment, which is about twice the size of that just mentioned, creates an excellent impression as the visitor enters (fig. 1). The scheme of decoration is Louis XVI with grey panelling throughout. The fittings which are so well displayed amid beautiful and appropriate furnishings, are of the French and crystal classes, of the 14th, 15th and 16th periods. Here again some of the best models have been drawn upon by the designer. Messrs. Falk, Stadelmann have for some years shown what importance they attach to having well-appointed showrooms for the use of the trade, architects, consultants and their clients, by their repeated efforts to increase the effectiveness of their premises, and by the selection of a very fine collection of fittings for display therein, but it is needless for us to add more here, for the pictures are better able to speak for themselves. Those who have fittings requirements would certainly not find a visit to Farringdon Road to be time thrown away.

BUSINESS NOTES.

Book Notices.—*The German Export Guide.* 1912.—This is a volume of between 500 and 600 pages, issued by the Hanseatischer Export-Verlag, G.m.b.H., of Hamburg. It contains a great deal of informing matter in English relating to German export trade, and is to appear annually, information respecting other branches, beyond those now covered, being promised for future editions. The various industries are reviewed in separate sections each of which is followed by a number of advertisements of firms concerned with those trades. German shipping, German export trade (export sample exhibition and commercial policy), mining industry, iron and steel, German machine industry (including steam engines and turbines, internal combustion engines, water-power plant, transmission plant, &c.), industrial machines, machine tools, motor-car industry, textile industry, scientific instruments—these and other subjects all have separate chapters devoted to them. There is, of course, a special section devoted to German electrical engineering industry, and its great developments, from which we gather that it is estimated that the number of workmen and staff now engaged in that industry is 170,000 (85,000 to 95,000 employed by the big companies manufacturing electrical material, and 80,000 by special branch firms). The money value of its yearly output is said to amount to at least 1,000 million marks, three-quarters being absorbed by the home markets, while a quarter finds its way to foreign countries. The exports for 1911 were 248 million marks. At the beginning of 1911 there were 2,700 public electric power stations in Germany with a total output of 1½ millions KW., a capacity of 2·6 millions KW., and an annual output of 2,150 million B. of T. units. From these some 11,000 towns and villages were supplied. Adding the isolated plants, it is estimated that there are 50,000 electric generating stations, with an output of 6·5 million KW., and an annual output of 7,000 million units. The following remark is made: "Although the German electrical engineering industry enjoys next to no protection at home, it nevertheless completely commands the German market . . . . and there is a steady increase of its exports to all parts of the world." This section is contributed by the "Verein zur Wahrung gemeinsamer Wirtschaftsinteressen der deutschen Elektrotechnik," of Berlin, and there is also a briefer section on "Various Lighting Systems," relating mainly to electric lamps and electric lighting.

Electricity in India, edited by Mr. S. M. Rutnagur, joint editor of the *Indian Textile Journal*. Bombay: Proprietors of the *Indian Textile Journal*. Price Rs. 2-8, post free, paper cover Rs. 1-12.—This is a pamphlet of about 80 pages in which the author deals principally with the Tata hydro-electric project and its inaugural ceremony, also with the progress made in electric power transmission since Messrs. Crompton & Co., Ltd., put up the first hydro-electric installation for the Darjeeling municipality in 1896. Information is given regarding the mill industry in Bombay and the relative cost of steam and electricity, material being also included descriptive of mill electrification work carried out in Lancashire. Toward the end of this interesting publication there is a useful directory of engineers interested in electrical work in India, and of manufacturers (with their agencies) who have been supplying installation machinery and plant there; another feature is a list of electrical power stations and plants in India.

"*Journal* of the Franklin Institute." Vol. CLXXIV, No. 4 October, 1912. Philadelphia: The Institute. Price 50 cents.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXI, No. 10. October, 1912. Price $1.

Careers in the Crucible. By Christopher E. Town.—This 24-page pamphlet contains an address delivered by Mr. Town recently before the Incorporated Phonographic Society at the Cripplegate Institute, London. The author is the assistant secretary of the London Chamber of Commerce, and secretary of its Commercial Education Department, and he has handled his subject in, to our mind, a masterly manner. The address must have been listened to with profound attention, for it combines a fund of interesting illustration with sage counsel accumulated in the course of practical experience rubbing shoulders with the world. He shows, among other things, how both the young hopeful's fancies and the fond parent's schemes are often frustrated, but he brings together a group of most useful ideas, which cannot fail to be instructive to the young mind and valuable to the guardian or parent in stimulating thought at such a period of life as to prevent a youth being content with having "a jolly good time," while he drifts along oblivious of such matters as the trade or profession that he ought to follow.

The Gas Works Directory and Statistics for 1912-13. London: Hazell, Watson & Viney, Ltd. 10s. 6d. net.—This is the thirty-fifth edition of a useful directory containing very full information respecting gas works, their areas, finance, personnel, and so forth, in England and Wales, Scotland, and Ireland. There is a brief section relating to foreign and colonial gas works having London offices. The particulars given are revised up to August last.

We have received a copy of the *Engineering Gazette and House Journal*, which is issued monthly by Messrs. Marryat & Place, of 28, Hatton Garden, London, E.C. It contains a great deal of entertaining and useful matter, and is a credit to its producers.

"*Journal* and List of Officers and Members of the Institution of Electrical Engineers." No. 215, Vol. 49. London: E. and F. N. Spon, Ltd. Price 5s.—The issue for September contains the following papers:—"On the Power Factor and Conductivity of Dielectrics," by Dr. J. A. Fleming and G. B. Dyke; "The Work of Lord Kelvin in Electricity and Magnetism," by Prof. H. du Bois; "Direct-current Watt-hour Meters," by S. W. Melsom and W. H. Eastland; "Electrical Meters on Variable Loads," by Prof. D. Robertson; "The Corrugation of Rails," by A. Schwartz and R. G. Cunliffe; Chairman's Address, Cape Town Local Section, by W. F. Long; "The Diesel Engine, from the User's Standpoint," by W. J. U. Sowter; "Weight Efficiency of Electric Motors and of Prime Movers," by W. B. Hird; "Induction Motor Design," by J. K. Catterson-Smith.

"*Transactions* of the University of Toronto Engineering Society." September, 1912. Toronto: The Society.

"*Journal* of the American Society of Mechanical Engineers." October, 1912. New York: The Society. Price 35 cents.

"Science Abstracts." Vol. 15, part 9. September 25th, 1912. Sections A and B. London: E. and F. N. Spon, Ltd. Price 1s. 6d. net each.

"*Bulletin* of the Association des Ingenieurs Electriciens." June, 1912. Liége: The Association. Price 7 fr.

"Electricity made Plain." By G. R. Peers. 1912. London: John Heywood, Ltd. Price 1s. net.

"Post Office Electrical Engineers' Journal," Vol. 5, Part 3. October, 1912. London: H. Alabaster, Gatehouse & Co. Price 1s. net.

"Report on The Equitable Building Fire, New York." By F. J. T. Stewart. London: The British Fire Prevention Committee. Price 3s. 6d.

"*Journal* of the United States Artillery," with "Index to Current Military Literature." Vol. 38, No. 2. September, 1912. Fort Monroe, Va.: The Coast Artillery School Press.

"Annales des Postes, Télégraphes et Téléphones." September, 1912. Price 6 fr. "La Service Postal de Chèques et Virements." By Léon Cazes. Paris: A. Dumas.

"The Measurement of Induction Shocks." By Ernest G. Martin. New York: John Wiley & Sons.

"*Engineering* Directory." October, 1912. London: *Engineering*, Ltd. Gratis.

Heavy Oil Engines.—The Aster Engineering Co., Ltd., of Wembley, Middlesex, who are well known in connection with the internal-combustion engine as employed in motor-vehicles and for other purposes, inform us that they have arranged with the Westinghouse Brake Co., Ltd., to undertake the manufacture of heavy oil engines of the semi-Diesel type, under the Westinghouse Cross Patents. The outstanding advantages of this type of engine, which has been described in our pages, include simplicity, substantial construction, high efficiency and economy in working. There are no complicated parts in the engine, which runs at a moderate speed, and the first cost of the engine is very small. The Aster Co. will produce a range of models—from one to four cylinders developing at normal engine speeds from 5 to 100 h.p.

The Shops' Act.—Pudsey T.C. has made an order under the provisions of the Shops' Act for the closing of retail electricians' establishments at 1 p.m. on Wednesdays.

Supper.—On Friday night last at Probyn's Restaurant, Dalston Junction, the annual supper and concert of Siemens Dalston Works Fire Brigade was held, Mr. A. M. Hicks being in the chair. An interesting programme was arranged by the supper committee, of which Mr. C. Lucken acted as hon. secretary, and a most enjoyable evening was spent.

Liquidation.—Fleetwood and District Electric Light and Power Syndicate, Ltd.—This company is winding up voluntarily, with Mr. W. Cash, 90, Cannon Street, E.C., as liquidator. A meeting of creditors is called for November 4th.

Colliery Installations.—Messrs. Sandycroft, Ltd., of Cheshire, have completed a double-drum haulage gear, electrically-driven, at 2,000 volts, three-phase, to the order of an Indian colliery, near Hyderabad; also a 400-h.p., 2,200-volt motor, to be used for driving an air compressor for one of the largest collieries in South Wales.

Trade Announcements.—Messrs. W. A. Davis & Co., of 13, Kinghorn Street, London, E.C., have been appointed sole agents for Great Britain by Mr. A. Kussmann, of Coln-Rhein, Germany, for cast and engraved metal name-plates; also sole agents for Messrs. Kaeser, Moilliet & Co., of Bern-Zollikofen, Switzerland, for advertising novelties in celluloid.

Mr. C. M. Simpson has opened offices in Canada House, Baldwin Street, Bristol, as agent and factor, and he desires to receive catalogues of electrical and mechanical apparatus, &c.

The Eastern Electric and Trading Co., who have changed their head office from Sukkur to Karachi, India, are in the market for all kinds of electrical goods, and want export lists and terms.

The Splitdorf Electrical Co., of New York, have opened an English branch at 6, City Road, Finsbury, London, E.C., for the sale of the Splitdorf magnetos and other electrical specialities.

The Windsor and Ascot Engineering Co., Ltd., electrical engineers, have opened new works at South Ascot.

The business of Mr. J. A. Brockett, electrician, &c., 13, Victoria Square, Whitby, and Robin Hood's Bay, has been purchased by Mr. T. H. Beecroft.

Mr. Amos Brook, late of the firm of H. Jaggar & Co., electrical engineers, Commercial Street, Batley, and 2, Halifax Road, Halifax, has commenced business at Hanover Street, Batley, under the style of A. Brook & Co.

Messrs. Victor H. Coates & Co. announce that from to-morrow (Saturday) their address will be 121, Victoria Street, Westminster, S.W., where they have taken more extensive premises.

According to *Commercial Intelligence*, the Automatic Wind Motor Co., Ltd., has been formed in Sydney to manufacture wind motors for generating electricity. A trial order has been given to the company by the New South Wales Railway Department.

Messrs. T. M. Johns & Co., of 41, George Street, Plymouth, have recently acquired additional stock rooms and facilities for dealing with plant and accessories and for rewinding and repair work to A.C. and D.C. motors.

Patent Applications.—Applications have been made for the restoration of the following patents:—

No. 25,217 of 1902, "An Improved Ore Roasting Furnace"; T. D. Merton.

No. 22,968 of 1904, "Improvements in Centrifugal Machines," W. E. and H. W. Lake.

No. 7,471 of 1900, "Improvements in Electric Telegraphy," S. G. Brown.

Application is to be made to Mr. Justice Parker in the Chancery Division on December 3rd respecting a petition for extension of Patent No. 8,961 of 1899, granted to Valdemar Poulsen, Copenhagen, for "Method of and apparatus for effecting and storing up of speech or signals by magnetically influencing magnetisable bodies."

Catalogues and Lists.—The Electrical Engineering and Equipment Co., Ltd., 109-11, New Oxford Street, London, W.C.—List (C. 1) of four pages, giving prices and particulars of their flame carbons, with and without metal core, also a special line of carbons for cinematograph projector work, which are claimed to show low current consumption, and to be run at high current density so that smaller diameters can be used. With C.C. the negative carbon has a copper-coated core, which prevents hissing and keeps the arc in the centre of the carbons. The carbons are impregnated with flame salts.

The Brimsdown Lamp Works, Ltd., Kingsway House, London, W.C.—We have received two attractively-coloured advertising novelties for the current lighting season—one is a gauze-mounted cut-out of John Bull holding a Brimsdown Wirum lamp of British manufacture, with the well-known wording, "See things in a better light," and the other is a hand and lamp cut-out with strut. These novelties are for general distribution to the trade; the gauze cut-out is printed in seven colours, and the hand and lamp cut-out in four.

The Langdon-Davies Motor Co., 110, Cannon Street, London, E.C.—16-page catalogue containing a specification of the firm's standard A.C. motors of short-circuited rotor and slip-ring types, and illustrating several applications of these motors. The company contradict a rumour that their organisation has entailed a change of staff and employés. The only alterations are in the management and in prices of motors, which have been considerably reduced. All the old workmen, the works staff, and the works manager who has been responsible for the design and manufacture of the motors for the last 16 years, are retained.

The D.S. Pulley Block and Crane Manufacturing Co., 78, Southwark Street, London, S.E.—32-page illustrated and priced pamphlet, particularising their various electric and other pulley blocks, travelling cranes and other lifting appliances, also electric runways.

The Electric and Ordnance Accessories Co., Ltd., Cheston Road, Aston, Birmingham.—New season's catalogue (32 pages), giving descriptions and numerous neat small illustrations, with prices, of various types of "Eclipse" electric convectors and luminous radiators, also the "Eclipse" electric cooker, water boilers, and other cooking appliances.

The Electrical Co., Ltd., 122-124, Charing Cross Road, London' W.C.—We have received a pamphlet (No. 21, of 16 pages) entitled "Electrical Advertising," which has been issued for the use of contractors and others interested in the advertising sign business. A special discount offer, which is open only until the end of October, accompanies it, being intended as a special inducement to contractors and others to help to make a bigger showing in connection with this department of electrical business. The list contains illustrations of new designs of zinc case letters, zinc block letters, glass reflector letters, universal advertising and live signs, kaleidoscopes, number indicators for music halls, &c. Prices are given fully in nearly all cases. Twelve distinct types are included, with prices in seven sizes. All the letters listed, except the glass reflector letter, are English made. The company will forward particulars on application. They hold that more business of this kind could be done if only it were properly pushed.

Mr. H. M. Budgett, Crown Works, Chelmsford.—New 12-page catalogue, containing excellent illustrations, description and prices of magnetic chucks, flat, for holding work on surface grinders, planers, &c., and rotary, for holding work on cylindrical grinders, lathes, &c.; also demagnetisers, countershafts, small generators and motor-generators, for supplying current for magnetic chucks and demagnetisers.

From Messrs. Cryselco, Ltd., we have received a couple of counter advertising cards of attractive coloured design, relating to the "Cryselco" metal-filament lamp. One carries a model of the lamp in card.

The British Aluminium Co., Ltd., 109, Queen Victoria Street, London, E.C.—Two new illustrated leaflets relating to aluminium wire for winding every kind of coil, and aluminium relay coils.

The "Chicago Rawhide" Co., Ltd., Hythe Road, Willesden, London, N.W.—Four-page price list of belting, lacing, packing, hammers, mallets and other "Chicago Rawhide" specialities.

The Sun Electrical Co., Ltd, 118-120, Charing Cross Road, London, W.C.—24-page illustrated price list of electric cooking and domestic electrical appliances; a variety of kettles, cooking outfits, hot-water jugs, boiling and warming plates, toasters, grills, restaurant apparatus, hot cupboards, electric ovens and irons, towel rails, suction cleaners, the "Belenus" boiler and other similar lines are included. Copies of the catalogue will be sent on application.

The Kramax Manufacturing Co., 12, Cambridge Lane, Glasgow.—Small priced pamphlet and cards relating to the "Ellco" invisible lamp lock.

Bankruptcy Proceedings.—Augustus Wm. Byron, described as of Park View Hotel, Hyde Park Corner, formerly of Chesterfield.—An application was made last week to Mr. Registrar Linklater at the Bankruptcy Court for an order of discharge. Mr. Walter Bayle, Official Receiver, reported that the applicant failed in April, with liabilities £65,029, and it was unlikely that any considerable amount would be realised from the estate. He attributed his failure to a loss of £70,000, incurred chiefly in connection with companies formed to acquire the British patents of a process for the manufacture of weldless steel tubes, and to ill health, which prevented him from earning an income during the past two or three years. In 1899, the debtor borrowed between £4,000 and £5,000, and, as a speculation, purchased at a premium upwards of 3,000 £1 shares in an electric battery company. The company was not a success, and the shares became valueless. The debtor estimated his loss over the transaction at about £6,000. The Official Receiver opposed the application on the grounds (1) that the assets were insufficient in value to equal 10s. in the £ on the amount of the unsecured liabilities, and (2) that the debtor had brought on his failure by rash and hazardous speculations. After hearing Mr. Albert Osborn in support of the application, the learned Registrar imposed a suspension of three years, observing that the general financial career of the debtor had been reckless in the extreme. He disclosed no assets, and filed his petition simply for the purpose of being whitewashed.—Order entered accordingly.

John Tizzard, electrical engineer, Abbey Road, Torquay.—First and final dividend, 2s. 5½d. in the £, payable October 29th at Official Receiver's office, 9, Bedford Circus, Exeter.

Fred Shaw, electrical contractor, Hessle Road, Hull.—November 4th is the last day for the receipt of proofs for dividend by the trustee, Mr. G. H. Acheson, York City Bank Chambers, Lowgate, Hull.

Mexico.—The present moment is favourable, says *Elektrotechnik und Maschinenbau*, for the export of electrical goods of all kinds to Mexico, and especially to the State of Durango. A whole series of electric installation schemes are in hand. Particular attention is being given to utilising the numerous waterfalls of the country which have hitherto attracted little attention. Among the installations foreshadowed are those of the Mexican Candelaria Co., which already owns a generating station, and is building two other hydro-electric works. The equipment contemplated consists of six turbine aggregates of 160 up to 6,000 kw. The Topia Mining Co. at Topia is building a power house, with a view to electrifying the working of its mine. Lastly, the lately-formed Durango Hydro-Electric Light and Power Co. is building 60 km. west of Durango, at El Salto, a generating station for the City of Durango.

Japan.—In Japan, according to the *Deutsche Electrische Rundschau*, there is observable an increasing demand for electro-technical specialities. This demand is attributable mainly to the creation of a number of hydro-electric stations, through the activity of local agents of foreign firms, a movement for which there is a great future. The use of electricity in Japan has made fairly rapid progress, and, besides a number of electric tramways, Japan possesses big power stations, which distribute light and power over considerable areas. There is a certain amount, but small, of competition with imported electrical goods from native manufacturing firms; but the Japanese industry suffers from a lack of skilled electrical workers, and must rely for a lengthened period on foreign imports, and, as the use of electricity is growing, a sustained demand for electrical articles may be safely reckoned upon.

Stoker Contracts.—Among important orders for stokers recently received by the Underfeed Stoker Co., Ltd., are the following:—

Usine Electrica de Monte Video, eight class "E"; Madras Electricity Supply Corporation, three class "E"; Newport Corporation Tramways, one class "E"; Mines de Houille du Grand Hornu, four class "A"; Sulzer Bros., for Japan, six class "A"; Sulzer Bros., for Riga, two class "A."

Fire.—Considerable damage was done by fire at the works of Elliott's Metal Co., at Selly Oak, Birmingham, last Saturday night.

Cable Works in Finland.—The first works in Finland for the manufacture of electric cables are about to be established in Helsingfors by a company which has just been formed with the title of the Finska Flatfabriken. The works will be under the management of Herr A. Wikstrom, who is stated to have studied electric cable manufacture in England and Germany.

LIGHTING and POWER NOTES.

Alloa.—Damage estimated at £70,000 was done by fire last week at the Devonbank Pit, Alloa. Much of the machinery and fittings was destroyed, including washing, picking and conveying plant, and electric cables.

Asiatic Turkey.—According to the German Consul at Beirout, since a Belgian Tramway Co. established there began to supply current for light and power, there has become apparent a demand for motors. Those already utilised, to the number of 100, are of ¼ to 2 H.P., and are employed for the watering of gardens, while some of larger power are used in the weaving industry and in the wood and metal trades. Damascus is the seat of an extensive flour-milling industry; nine flour mills are at work, whose motive power is derived from turbines, principally of French manufacture.

Atherton.—At a meeting of the U.D.C. last week the electrical engineer mentioned that after the winter load is over, it will be necessary to renew the H.T. switchboard at the sub-station. It was decided to invite tenders for new transformers, and a sub-committee was appointed to inspect the switchboard at the sub-station.

Australia.—The N.S.W. Minister of Works states that a Melbourne syndicate is willing to spend £500,000 in a scheme to dam the Buddong Falls, and generate power to run an electric railway and a carbide plant. The Minister intimated that the Government might take the matter up itself.

The Sydney City Council has decided to expend £52,500 in installing an underground storage battery, to be brought into use in April, 1914. The City electrical engineer's report as to the extension of electric street lighting through all streets at present lighted by gas has been adopted.

The Melbourne Electrical Supply Committee has withdrawn its proposal to obtain powers to hire and sell electrical fittings to consumers, and the matter now stands in abeyance.

It was proposed by the Port Melbourne T.C. to install an electrical plant at a cost of about £8,000, but, having consulted Mr. H. R. Harper, the electrical engineer of the Melbourne City Council, it has been decided to adopt the three-phase system in order to secure a better supply. Fresh tenders are being called for cables and poles.—*Australian Mining Standard.*

Barrow-in-Furness.—The T.C. has received from the L.G.B. sanction to a loan of £21,484 for electricity purposes.

Basingstoke.—A prov. order for E L. is being applied for by Messrs. Edwards & Armstrong, of Bristol, and the matter is to be considered by the T.C. at a special meeting.

Bridport.—The T.C. has retained Mr. E. M. Lacey to report on a proposed electricity scheme, at a fee of 100 guineas.

Canada.—A general reduction in power rates benefiting over half of the municipalities in the Niagara Power zone has been decided upon by the Ontario Hydro-Electric Commission. The reduced rates are based upon an expected increase in the consumption of 30,000 H.P. at the end of the current month. The new rates, which are a 3 to 15 per cent. reduction, will come into effect on November 1st.

Carlisle.—An interesting exhibition of electrical appliances was held last week at the Church Hall, which adjoins the Corporation electricity works. Included in the exhibits were domestic apparatus for heating, cooking, vacuum cleaning and ironing. It is claimed that the special new tariff for electricity in the city allows consumers to light and heat their houses, and cook their meals, at a lower price than by any other means, and to have, at the same time, all the advantages which electricity affords. The opening ceremony was performed by the Mayor, in the presence of a large gathering, the chair being occupied by Dr. Overton, chairman of the Electricity Committee.

Cromer.—The U.D.C. has decided, subject to the approval of the L.G.B., to transfer its electric light undertaking, for which £30,000 had been raised on loan during the past 10 years, to Messrs. Edmundsons, Ltd., who will have to pay the Council £18,000 in extinction of outstanding loan liabilities.

Dalkey.—The question of electric light supply was considered in connection with a letter from the town clerk of Kingstown in reply to a request that the Kingstown Council should defer coming to a decision on the electric lighting question until Dalkey had an opportunity to discuss the matter. The town clerk read the resolution of the Kingstown Urban Council. The resolution granted permission to a solvent public or private company to open up streets for the purpose of supplying electric light, &c., "always provided that this permission will be granted only on the condition that the Councils of Blackrock and Dalkey shall also approve of said undertaking, and shall join with this Council in entering into an agreement safeguarding the rights of the several parties." Mr. Booth submitted a report of an interview of a deputation of the Dalkey Council with the promoters of the electric lighting company for Kingstown, Blackrock and Dalkey, and it was agreed to favourably consider the granting of permission to any company which proposes to supply the district. Mr. Conan said that the company's proposal was to run a main as far as Castle Street, and after that further mains to the extent of one mile. Bearing in mind that the distance from Castle Street to Sorrento Point was practically seven-eighths of a mile, it left very little possibility of extension to any other part of Dalkey. Any scheme to which they could give their approval should be sufficiently elastic to, at least, give a hope that in the near future every main road in Dalkey would be supplied with electric light. The promoters met that objection by saying that they would be prepared to extend their system by running another mile of main, which, they said, would cost £1,300 a mile, if they got a guarantee of an annual income of 20 per cent. of the cost of the main, or, in other words, £260 for a mile of main. It was decided to appoint a Sub-Committee.

Ealing.—At the Ealing Chamber of Commerce last week, Mr. Timpson drew attention to the municipal trading carried on by the Electric Lighting Committee. That Committee, he said, was taking orders for the supply of outside lamps and the hire of electric fans, and he had also heard it stated that it was supplying Osram lamps, although this had been denied. He understood that in the Town Hall extension scheme it was proposed to have a large showroom for the electricity undertaking to show improved methods of using electricity for heating, cooking, and so on. He had no objection to such a showroom, provided it did not attempt to sell against contractors and tradesmen. The Chamber unanimously decided that a letter of protest be sent to the T.C. against any municipal trading by its Electric Lighting Committee that in any way competed with local private enterprise.

Glasgow.—Owing to the great demand for electricity the T.C. some time ago acquired ground in the Dalmarnock district for the purpose of erecting another power station. An exhaustive report on the whole position was submitted by the engineer at the last meeting of the T.C. He points out that when the new station at Dalmarnock has been properly equipped, Port Dundas and St. Andrew's Cross would be used principally as peak load stations—*i.e.*, in meeting the great demand from October to March for lighting. At other periods—*i.e.*, during the summer months—H.T. energy would be transmitted to those two stations from the Dalmarnock works for transformation and distribution in their immediate areas. Govan and Partick Electricity Works would not be extended as generating stations, but for the increasing demand in the areas of these stations extra H.T. energy would be transmitted to them, and transforming plant installed there. As soon as convenient the steam plant in these works would be shut down, as a saving of between £4,000 and £5,000 per annum could be effected by the use of energy generated at Dalmarnock station and transformed for distribution in the Partick and Govan areas. The general manager has been instructed to prepare rough ground plans showing a general arrangement for a generating station, and to submit a statement of the cost of a section of the station.

Great Harwood.—The U.D.C. has approached the Accrington Corporation with a view to obtaining the terms upon which it will supply current to the township. This is an alternative scheme to the one drawn up by the consulting electrical engineer for the establishment of a local generating station. The cheaper scheme will probably be accepted.

Greenock.—In regard to the understanding arrived at between the T.C.'s of Greenock and Port Glasgow with respect to the latter obtaining a supply of electricity for power and lighting purposes, at a meeting of the Greenock Corporation it was agreed to give an immediate supply to power users, and arrange for low-pressure lighting mains being laid in the principal streets in Port-Glasgow. The Council of the latter town is to at once apply to Parliament for an electric lighting order, the transfer of which will be accepted by the Greenock Corporation. The rates to be charged for lighting purposes are not to exceed by more than 5 per cent. those charged to Greenock consumers.

Mr. Robertson, the T.C. electrical engineer, has reported that the estimated cost of laying a low-pressure lighting main in the streets scheduled under the draft order would be £2,850, and for the additional streets specified in the Port Glasgow resolution, £750, exclusive of consumers' services and meters, estimated at £1,450, or a sum of £5,000 to be added to the expense of providing the supply to the power users.

Harwich.—The E.L. has been installed at the station, quay and pier, current being supplied from the G.E.R. Co.'s plant at Parkeston.

Hastings.—The T.C. on October 18th decided to apply to the L.G.B. for loans of £3,000 for mains, £500 for meters, £1,500 for house services, and £500 for transformers. A loan of £423 for mains extensions in the old London Road, by which 18 gas lamps will be converted to electricity, has also been applied for.

Heckmondwike.—The U.D.C. has given formal notice to the Bradford Dyers' Association to determine the agreement for the supply of electricity.

Keighley.—The T.C. has decided to apply to the L.G.B. for sanction to borrow £7,000 for the provision of a new 2,000-KW. turbo-alternator, complete with condensing plant and foundation, at the electricity works.

Ledbury (Herefordshire).—At a meeting of the U.D.C. it was reported that Messrs. Brown & Parsons, Ltd., Leamington, were applying for Parliamentary powers which would enable them to tender for the public lighting of Ledbury by electricity.

Leeds.—At a special meeting of the City Council on the 17th inst., consideration was given to a report of the manager of the Corporation Electricity Department on the provision for future requirements of electrical energy, the proposal being to request the Parliamentary Committee to include in the next Bill in Parliament promoted by the Corporation, the necessary powers for the acquisition of a site in South Accommodation Road for the purposes of an electricity generating station. Mr. R. Armitage, chairman of the Electricity Sub-Committee, outlined the scheme, and said in the Accommodation Road proposal there was put down for land, £6,000 per acre for 10 acres, and in an alternative scheme a site for £30,000. After an hour's discussion it was decided to request the Parliamentary Committee to seek powers for the acquisition of a site for the purpose of a new station.

Limehurst.—With reference to the supply of current to Crossbank by Oldham T.C., the latter body has asked the Limehurst U.D.C. to place in the agreement a clause providing that if at any time the U.D.C. decides to supply current itself, it will take over the plant to be provided at Crossbank, as, under such circumstances, it would be useless to the Corporation. The Council has agreed to insert the clause mentioned.

Littleborough.—At the Greenvale Mill, owned by Messrs. Fothergill & Harvey, Littleborough, near Rochdale, the whole of the ring frames are now operated by motors on the individual drive system, the A.E.G. Electric Co., Ltd., of Manchester, being responsible for the installation.

Liverpool.—During the past 12 months over 8,000,000 units have been generated from refuse at the destructors of the Corporation.

London.—A proposed agreement between the Central Electric Supply Co. and the Chelsea Electricity Supply Co., to enable the former to give a bulk supply of energy to the latter, has been submitted to the L.C.C., and certain amendments have been suggested in conjunction with the Special Committee on London Electricity Supply.

Islington.—With reference to the letter received from the County of London Co., suggesting that the Council should take a bulk supply from the company's mains, a reply is to be sent, stating that the Council is satisfied that the damage would not have been less, or the supply resumed earlier, if the Council's station had been connected with any other generating station, inasmuch as the spare generating plant was more than sufficient to deal with the load.

Fulham.—As an indication of the progress and development of the electricity undertaking during the past five years, the following statements of units sold and of consumers connected has been issued:—1907-8, (*a*) units sold, 2,840,626: (*b*) consumers, 2,440; 1908-9, (*a*) 3,165,734; (*b*) 2,722; 1909-10, (*a*) 3,202,208; (*b*), 3,058; 1910-11, (*a*) 3,331,497; (*b*) 3,409: 1911-12, (*a*) 3,512,266; (*b*) 3,843.

Westminster.—The Works Committee reports that it has considered the Council's option to give six months' notice to determine the contract of September 18th, 1899, with the Charing Cross Electric Supply Co. for public electric lighting in the parish of St. Martin-in-the-Fields and a portion of the Strand district, at the end of the fourteenth year of the contract, viz., September 17th, 1913. To exercise the option, notice would have to be given to the company on or before March 17th, 1913, but if the option is not exercised the contract will run for the full period of 21 years. Having regard to the conditions attaching to the termination of the contract before the full term of 21 years, the Committee says it would appear to be inadvisable to consider as to the curtailing the term of the contract, unless the Council contemplated taking over the undertaking to the extent referred to in Clause 14 of the contract.

The Committee also reports having considered the possibility of effecting an improvement in the light provided under the contract. Clause 5 requires the company to supply the lamps with electricity of an energy of not less than 500 watts per hour, giving an actual minimum and continuous candle-power of at least 1,000 per lamp. 124 lamps are lighted, and maintained by the company under the contract. In the case of about 50 of these, the company have, with the concurrence of the Council, provided modern flame arc lamps of the Johnson and Phillips type. These lamps give illumination greatly superior to that of the old open-type arc lamps, and the Committee is of opinion that if suitable terms could be arranged, it would be of great advantage if more powerful modern lamps could be substituted for the remaining open-type arc lamps. The company is, therefore, to be asked upon what terms it would be prepared to improve the public lighting under the contract, and to guarantee a standard of light to be agreed upon. The Contracts Special Committee reports that the Council's contract with the Westminster Electric Supply Corporation, for the supply of electrical energy to the Council's premises will expire on December 31st next, and that it has decided to continue the contract for a further period of one year from January 1st next.

Marylebone.—In consequence of fumes arising from the gas-heating apparatus at St. John's Wood Road and Marylebone Road conveniences and the overheating and bad ventilation thereof, the substitution of electric radiators for the gas-heating apparatus has been decided on, and the offer of the electricity department to provide electric radiators, including the necessary wiring, &c., at these conveniences for the sum of £17 has been accepted.

Greenwich.—The South Metropolitan E.L. and Power Co. is to enter into an agreement with the L.C.C. for a supply of electricity for lighting Blackwall Tunnel and working the pumps. The agreement provides for not less than 100,000 units per annum, and up to 50 KW., the normal being 25 KW., at a price of ·96d. per unit, and is to cover a period of five years, subject to reduction of the charges to correspond with any reduction made by the company to other consumers.

New Zealand.—The Whangarei B.C. has appointed a special committee to consider the desirability of installing an electric lighting plant for the borough at a cost of about £12,000. The original proposition was to utilise the water-power of the Wairua Falls for the development of electrical power, but that scheme has been indefinitely postponed.—*Australian Mining Standard.*

Rawtenstall.—The borough electrical engineer has been empowered to obtain a light tower wagon to be used in connection with the cleaning of electric street lamps, &c. On his recommendation it has been decided to obtain an additional boiler for the electricity works, together with the necessary superheater, mechanical stoker, feed pump, &c.

Romford.—Mr. W. T. Pressland has written to the U.D.C. asking that body to provisionally approve of his E.L. scheme for the town. As there are two other schemes proposed, the clerk has replied that the Council cannot give preference to any one of them.

Sevenoaks.—Having received evidence of sufficient support, Sevenoaks and District Electricity Co., being formed by Messrs. Crompton & Co., has been registered, and the requisite sum of money deposited. The U.D.C. holds its own prov. order, and that body has decided to interview the B. of T. respecting Crompton and Co.'s scheme, which the Council is supporting, and the dealing with the prov. order.

Sheffield.—Sanction has been received from the L.G.B. to the borrowing of £57,000 for mains (repayable in 25 years), £9,000 for services (repayable in 15 years), and £40,000 for sub-stations, transformers and power factor rectifiers (repayable in 15 years). The Electric Light Committee considers that the period of repayment for the latter sum is very short, and the L.G.B. is to be urged to extend the period to 25 years.

Shipston-on-Stour.—Messrs. Brown & Parsons, of Leamington, who are carrying out an E.L. scheme at Shipston, have approached the B. of G. as to supplying current for the workhouse, which is at present lit by oil lamps. The Guardians have decided to wait and see how the electric light answers in the town before deciding upon the matter.

South Africa.—The Durban borough electrical engineer has suggested that the T.C. should arrange to hire out electric heating stoves to small consumers. He proposes, in the first instance, to call for tenders from local contractors for the supply of low-priced electric heating stoves suitable for small households. He also stated that if experiments which are being made locally to produce a cheap and simple stove should prove successful, tenders will be invited for the supply of stoves of the improved pattern.

Taunton.—The T.C. has altered the charge for current for heating purposes from 2d. per unit to 2d. for the first 50 units per quarter, and 1d. beyond.

Treharris.—The public supply of current to Treharris, Merthyr Vale, and Aberfan, provided by the Merthyr Tydfil Electric Traction and Lighting Co., Ltd., was switched on at the Penydarren generating station on October 17th, by the Mayor of Merthyr, Alderman J. N. Berry, J.P.

West Kilbride (near Ardrossan).—A suggestion has been made that a scheme be brought forward for lighting the village by electricity. Several persons are contemplating the adoption of private installations, power for which will be derived from small turbines driven by the gravitation water. It is said that there is a possibility of the local authorities taking up the matter.

Windsor.—An offer made by the Windsor Electrical Installation Co. to do the pumping at the sewage farm has been accepted by the T.C. The company agrees to do the work for 12 months, and not charge more than the pumping has cost before. In the event of the electrical plant failing, the company will recompense the Council for the use of the steam plant, and at the end of the period stated, the Council will have the option of adopting the new method permanently, or of not doing so.

Worsley.—The U.D.C. has approved of the scheme of the Lancashire Electric Power Co. for electric lighting in the district, subject to all cables being laid underground, &c.

TRAMWAY and RAILWAY NOTES.

Australia.—Parliamentary sanction is being sought for the substitution of electric for steam traction on the railway between Adelaide and Glenelg, a distance of 6¾ miles, at an estimated cost of about £115,000. It is probable that the Act authorising the expenditure will be passed this Session, but work is not likely to be commenced before 1913.

Bournemouth.—A public meeting was recently held to protest against the proposed running of Sunday cars in the town. Apparently over 2,000 people attended, and the proceedings were not wholly in favour of the protest. Although a resolution to that effect was "declared" carried, we note that a call from the audience to move an amendment was not responded to, and that the discontented voiced their disapproval in the usual way.

Bradford.—A heavily-signed petition has been presented to the Corporation in favour of the proposed extension of the tramway system from Thornton terminus to Keelham Hill.

Colwyn Bay.—The Light Railway Commissioners have issued an order, which has been confirmed by the B. of T., authorising the construction of tramways in Colwyn Bay, Colwyn and Conway, being an extension of the undertaking authorised by the Llandudno and Colwyn Bay Light Railway Orders, 1898 to 1907.

Glasgow.—The proposal by the Sub-Committee on Tramways to appeal against the municipal assessments for 1912-13 was discussed by the T.C. last week. It was pointed out that assessments had been imposed on the full valuation of the tramway lines, notwithstanding that it had been decided this year in the King's Bench Division of the English Courts, that a system there was liable to be assessed on only one-fourth of the valuation of the lines. The town clerk gave the opinion that the English case did not help Glasgow at all. It was made clear, in the case referred to, that the decision was due to the fact that it was a one-connected system, viz., a tramway and a light railway. Bailie Pratt was dissatisfied with the ruling, pointing out that he did not see why they should go on paying full rates when they should only be charged one-fourth. If they wanted the tramways department to subsidise the rates, they should not do so in this hole-and-corner fashion. Mr. James Stewart argued that by means of the present method of taxation, the tramways were made to contribute something like £17,000 per annum. Mr. Robert Graham explained that an appeal on the lines suggested by Mr. Pratt had been made to the Sheriff, and had been dismissed. The *status quo* was maintained on a division.

The general manager reported to the T.C.'s Committee on Tramways that the Glasgow Corporation Tramways Friendly Society, as at present constituted, would, in consequence of the National Insurance Act, 1911, be discontinued as at December 31st next; that over 1,700 employés in the department had expressed their willingness to continue the present society in supplement of the benefits under the National Insurance Act; and that they would be prepared to contribute weekly 3d. per member towards the funds of the society. The Committee, after careful consideration, agreed to recommend (1) that the Corporation should contribute weekly the sum of 1d. per member to the said funds, and (2) that its representation on the Committee of Management of the society be proportionate to its contribution.

Huddersfield.—The Corporation has confirmed a resolution of the Tramways Committee (1) approving of the plans and estimates of cost submitted by the borough engineer, in respect of the proposed tramways extensions, viz.:—Brighouse, Elland, Marsden, Longwood (Dod Lea), Crosland Hill, Kirkheaton, Beaumont Street, Gasworks Street and St. Andrew's Road; and (2) instructing the borough engineer to take the necessary steps to prepare the same for Parliamentary deposit.

Irlam.—Several employers of labour in the district having petitioned the Council, urging it again to approach the Salford Corporation with a view to extending the tramways from Peel Green to Irlam and Cadishead, a resolution was proposed and seconded at the meeting of the U.D.C. that the clerk be instructed to enter into negotiations with the Corporation. An amendment was then moved that the matter be referred to the General Purposes Committee. Eventually both the resolution and the amendment were withdrawn, and it was decided to discuss the matter in private.

Japan.—The Musashi Electric Railway Co. proposes to construct an electric railway between Tengenji, Azabu, Tokio and Takashimacho, Yokohama, with a branch from Chofumuna to Kamata and another from Himonza and Shinzuku.

Llandudno.—The U.D.C. at its meeting on Friday, October 18th, received a report from the deputation appointed by the Council respecting the interview it had with Mr. Balfour, the director in charge of the electric tramway undertaking, respecting the proposed extension of the Llandudno and Colwyn Bay Light Railway Co.'s line. As a result of the interview terms have been arranged for doubling the track, and this will be carried out during the coming winter. The tramway company will contribute £200 towards the cost of road widening; the company will also supply fittings for lighting the overhead standards in Bodaton Road, on the understanding that the Council will undertake the future maintenance of the lamps. Mr. Balfour stated, in a letter received subsequently to the interview, that subject to the interests of the company being safeguarded, he would assist the Council in reducing the number of standards in the streets by allowing the Council to make use of the tramway poles for public lighting purposes. The report of the deputation was unanimously approved.

North-Eastern Railway Electrification.—The North-Eastern Railway Co. has under consideration a proposed extension of electrification to a portion of its system in County Durham; the section of railway under consideration is the mineral line from Sheldon to Newport, near Middlesbrough, the distance being about 20 miles, and forming one of the busiest lengths of mineral railway on the North-Eastern system.

U.S.A.—A proposal is on foot for providing passenger subways in Chicago at an approximate cost of £19,260,000. The cost of the equipment is placed at £6,970,000, and includes a power system with generating and sub-stations, &c., and third-rail equipment.

Wharfedale.—There seems to be considerable difference of opinion existing between Menston, Otley, Burley and Ilkley District Councils concerning a proposal of the Leeds Corporation to run railless cars from the tramway terminus at Guiseley to these places. The three former Councils view the proposal with favour, but at Ilkley—which is a residential town serving the cities of Leeds and Bradford, and a noted health resort—a cautious attitude is being adopted, because the town would be differently affected from the other places. No decision for or against the suggestion has yet been arrived at by the Ilkley Council.

TELEGRAPH and TELEPHONE NOTES.

Australia.—The offer of the Marconi Wireless Co. and the Australian Wireless (using the Telefunken system) of their respective patents in Australia to the Federal Government, which the Postmaster-General has declined to entertain, says a Melbourne telegram to the Perth *West Australian*, was that the Commonwealth should pay £40,000 down and give the companies a contract for £60,000 to erect the proposed high-power station at Port Darwin, together with an agreement to give them 10 per cent. of the gross takings from that station for 28 years. The £60,000 was to be exclusive of site, foundations for machinery and buildings, and the cost of the buildings themselves. Thus, for an outlay of more than £100,000 at the outset, Australia was to get one station, and was to have the privilege of erecting others at its own cost, and using the companies' patents. The Postmaster-General has decided to go on with the scheme of the Department's expert. Under this, for less than £100,000, not only the Port Darwin high-power station, but nine others will be erected round Australia. The patents of the companies will not be used, the Federal Government contending that the Balsillie system does not infringe them in any way.—*Financier.*

Austria.—The wireless station which has been erected on the roof of the Ministry of War at Vienna consists of two lofty masts, equipped with antennæ similar to those used on board ship. Its range will be only about 500 km., reaching as far as Budapest, Prague, Krakow and Passau. The Austrian naval ports of Pola and Sebenico lie, however, outside its range.—*Zeit. des Oest. Ing. u. Arkt. Verein.*

Belgium.—A powerful wireless telegraph station is under construction at Laeken, near Brussels, to permit communication with Boma, in the Congo, either directly or by way of Dakar. According to anticipation, it will be possible to communicate between Brussels and Boma about the beginning of next year. There are at present 10 stations in the Belgian Congo.—*The Times.*

Imperial Wireless System.—The Government have appointed Sir Albert Spicer chairman of the Select Committee on the Marconi Agreement, which will commence its sittings to-day.

Switzerland.—An understanding has been reached between the German and Swiss Governments as regards the building of a wireless station on Mount Säntis. This station, when completed, will be able, by means of the recently opened station on the Zugspitze, to effect communication right across the Alps.—*Elektrotechnische Zeitschrift.*

Wireless Rescue.—Owing to a violent outbreak of fire on board the *Berkshire*, carrying cotton, the lives of 100 passengers were endangered. Help, however, was summoned by wireless, and the passengers were taken off while the ship was still 50 miles from land, off the shore of North Carolina.

Wireless Telegraphy.—According to the *Daily Telegraph*, M. Valdemar Poulsen intends to establish wireless communication between Scandinavia and America, *viâ* an intermediate station in South Greenland.

The Admiralty are arranging for periodical practices in wireless communication between warships and ships of the British mercantile marine, for the purpose of ensuring efficient and reliable communication when required under the regulations.—*Times.*

CONTRACTS OPEN and CLOSED.

OPEN.

Aldershot.—November 5th. Balancer for the U.D.C. See "Official Notices" October 18th.

Atherton.—November 6th. One 250-KW. single-phase transformer, for the U.D.C. See "Official Notices" to-day.

Australia. — South Australia. — November 27th. 18 miles paper-insulated cable, 155,000 jointing sleeves, also switchboard cable (Schedule 248). See "Official Notices" October 18th.

December 11th.—Line material (Schedules 250-252), and submarine telegraph cable and cable tank, for the P.M.G.'s Department. See "Official Notices" to-day.

December 17th. Three sections of common-battery multiple switchboard and other equipment, for the P.M.G.'s Department. See "Official Notices" to-day.

Victoria.—November 12th. Deputy P.M.G., Melbourne. 100 electrical registers. High Commissioner's Office in London.

November 8th and 12th.—(*a*) 340 A.C. and 800 D.C. electricity recording meters; and (*b*) insulated copper cables, for the Melbourne City Council. See "Official Notices" to-day.

November 19th.—One mercury vapour converter, for the P.M.G.'s Department. See "Official Notices" Oct. 11th. Also two batteries and a 4-K.V.A. single-phase transformer. High Commissioner in London.

Western Australia.—November 5th. Telephone switchboards to Stores Schedules 222 and 223, for the P.M.G.'s department, Perth. See "Official Notices" October 11th.

"The Postmaster-General will shortly invite tenders for the construction of a tunnel for the conveyance of mails between the G.P.O., Melbourne, and Spencer Street. The load will be suspended from a rail at the top of the tunnel and electrically propelled."—*Mining and Engineering Review (Tenders).*

New South Wales.—December 11th. Telegraph cable, for the P.M.G.'s department. See "Official Notices" to-day.

Austria.—Vienna.—November 1st. Tenders are invited for the supply of 657 red larch telegraph poles of various sizes for the Austrian post and telegraph service. Particulars, with printed tender forms, from the K.k. Post und Telegraph Direction, Hetzgasse II, Wien III.

Zenica, October 30th.—The authorities of Zenica are prepared to receive offers for the establishment of an electric light service in the town. Particulars of the Gemeindeamt in Zenica.

Barrow-in-Furness.—November 5th. Electrical and steam plant, &c., in connection with the electricity works extensions, for the Corporation. See "Official Notices" October 18th.

Belgium.—November 7th. La Société de l'Exposition Universelle et Internationale de Gand 1913, of Rue des Moineaux, Ghent, is inviting tenders for—(1) An installation of electric lighting in the Palais des Fêtes; (2) ditto in two restaurants connected with the Palais de l'Horticulture; and (3) ditto in the Palais de l'Horticulture.

Brighton.—Private telephone service and electric fire alarms, Warren Farm Schools, for the B. of G. Mr. P. Coote, consulting electrical engineer, 3, North Street Quadrant, Brighton.

Canada.—October 31st. One 500-B.H.P. Diesel engine, alternator, exciter, switchboard, tungsten street lighting apparatus, for the town of Yorkton, Sask. Apply Board of Trade Commercial Intelligence Department in London.

Dublin.—November 4th. General stores for a year, for the Dublin United Tramways Co., Ltd. See "Official Notices" October 18th.

November 5th.—3,000-KW. steam turbo-alternator, with exciter, condensing plant, piping, &c., for the Corporation. See "Official Notices" October 18th.

Christchurch.—November 1st. Electric light installation at the Workhouse and Cottage Homes, for the B. of G. Mr. T. A. Digby, consulting engineer, 32, Shaftesbury Avenue, London, W. Returnable deposit of £5.

Glasgow.—October 28th. The Caledonian Railway Co. invite tenders for various stores for the year, including telegraph appliances, telephones, &c., electric lighting material and fittings. J. Blackburn, secretary, company's offices, 302, Buchanan Street.

Keighley.—November 11th. One 2,000-KW. steam turbo-alternator, for the Corporation. See "Official Notices" to-day.

Leigh (Lancs.).—October 30th. About 4,000 tons of steam slack, for the Corporation Electricity Works. Electrical Engineer, Albion Street.

London.—L.C.C.—November 4th. Carbons, fittings, insulating materials and lamps, for a year. See "Official Notices" October 18th.

BATTERSEA.—October 25th. Twelve internal telephone instruments and lines, for the B.C. See "Official Notices" Oct. 18th.

PORT OF LONDON AUTHORITY.—November 1st. Stores and materials, including carbons for electric arc lamps, carbon filament lamps, glass and glassware, india-rubber and gutta-percha goods, steam and other fittings, &c. Stores Superintendent, 106, Fenchurch Street, E.C.

L.C.C.—November 6th. Electric lighting installation at Mantua Street School, Battersea. See "Official Notices" to-day.

Neath.—October 31st. Coal (through-and-through, or small steam) for the R.D.C. generating station, Court Sart, for six or twelve months. Mr. G. H. Thomson, electrical engineer and manager, 12, Green Street, Neath.

New Zealand.—December 16th. Two 150-B.H.P. Diesel engines, two 100-KW. dynamos, balancer, motor-generator, switchboard, crane and oil tanks for Miramar (Town Clerk). Deposit £200. Board of Trade Commercial Intelligence Department, London, E.C.

Rawtenstall.—The T.C. has decided to purchase an additional boiler, with superheater, mechanical stoker, feed pump, &c., for the electricity works, and a light tower wagon for use in cleaning the street electric lamps.

Rio de Janeiro.—November 11th. Tenders to the Directoira Geral de Correios, Telegraphos e Illuminacão, Ministerio da Viação e Obras Publicas, Rio de Janeiro, for the construction and working of an overhead or underground telephone system designed to join up the cities of Rio de Janeiro and São Paulo. The *Diario*, containing further particulars, may be seen at the Commercial Intelligence Branch of the Board of Trade, London, E.C.—*Board of Trade Journal.*

Salford.—October 28th. One hundred tramway poles and fittings. General Manager, 32, Blackfriars Street, Salford.

South Africa.—November 18th. The Municipal Corporation of Cradock, Cape Province, is calling for tenders for two 50-KW. Diesel oil engines and dynamos complete, also supply mains and public lighting. Specifications from Mr. R. A. Paterson, town clerk, on deposit of £2 2s.

Switzerland.—KÖLLICKEN.—The authorities of Köllicken, near Aarau, are open to receive tenders for the installation of an electric service, consisting of a high-pressure network 2 km. in extent, a generating station, four transformer stations, and the secondary network with street lighting. Particulars from Ingenieur Matter, Kantonal Waterbaubureau, Aarau.

Tonbridge.—October 28th. One 100-KW. Diesel engine and generator, and alterations and additions to switchboard, for the U.D.C. See "Official Notices" October 11th.

York.—November 16th. Construction of about 1¼ miles of light railways, for the T.C. Mr. H. Craven, Town Clerk. Returnable deposit of £5.

CLOSED.

Argentina.—According to *Commercial Intelligence* the only tender for the concession to construct an electric tramway in Santiago del Estero, Argentina, was submitted by Messrs. Roberts, Perona & Co., of that town.

Australia. — According to the *Australian Mining Standard* the following contracts have recently been placed :—

Victorian Railways.—
Automatic telephone switchboard (£2,439) and supply of wall and table sets.—Automatic Telephones (Australasia), Ltd.

Sydney Municipal Council.—
Metal-filament lamps, £212.—Australian Metal Co.
Fibre conduit, £958.—Noyes Bros. Propty., Ltd.
A.C. and D.C. panels, £310.—Australian G.E. Co.

Tenders (*Mining and Engineering Review*) states that the W.A. Tender Board has ordered electric train lighting material (£331) from the Hart Accumulator Co., Ltd.

Bradford.—The Tramways Committee of the T.C. has accepted the tender of Messrs. Hurst, Nelson & Co., Ltd., for 48 car trucks, at £81 each.

Brighton.—The B. of G. has accepted the tender of Messrs. A. E. Dean & Co., of London, for an X-ray apparatus, at £133.

Epsom.—The U.D.C. has accepted the tender of Messrs. Perch & Co. for 200 tons of anthracite washed nuts for the electricity works, at 30s. 6d. per ton, and for 300 tons of Welsh through-and-through coal, at 19s. 11½d. per ton.

Faversham.—The T.C. has accepted the tender of Mr. Davis, of Faversham, for 250 tons of anthracite coal for the electricity work, at £1 15s. 9d per ton.

Glasgow.—The following offers have been recommended for acceptance by the T.C.'s Tramways Committee :—

Lighting fittings.—Siemens Bros. & Co., Ltd.
Scrap—(*a*) Cable, (*b*) copper, (*c*) zinc.—R. M. Easdale & Co.
Copper strip.—Leslie & Hall.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named :—

WAR OFFICE.

Electric cable.—British Insulated and Helsby Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. and Co., Ltd.; Western Electric Co., Ltd.
Conduit fittings.—Accles & Pollock, Ltd.; Barton & Sons, Ltd.; Brotherton Tubes and Conduits, Ltd.; Credenda Conduits Co.; Eureka Conduits and Fittings Co.; Nettlefold & Sons, Ltd.; Walsall Hardware Manufacturing Co.
Electric light fittings.—Bulpitt & Sons, Ltd.; Edison & Swan United Electric Light Co., Ltd., General Electric Co., Ltd.; S. Heath & Sons, Ltd.; D. Hulett & Co., Ltd.; Simplex Conduits, Ltd.
Erection of electric power station, Tidworth.—W. P. Goose & Sons.
Overhead conductors and supports for electric light installation, Tidworth and Bulford.—G. E. Taylor & Co.

INDIA OFFICE, STORE DEPARTMENT.

Accumulators.—D.P. Battery Co.
Cable.—London Electric Wire Co., and Smiths, Ltd.; Siemens Bros. & Co.
Cells.—Siemens Bros. & Co.; Tudor Accumulator Co.
Switchgear.—British Thomson-Houston Co.
Switches, &c.—Isca Foundry Co.
Switchboard, &c.—Peel-Conner Telephone Works.

CROWN AGENTS FOR THE COLONIES.

Telephone cable.—Henley's Telegraph Works Co., Ltd.
Electric capstan and accessories.—Clarke, Chapman & Co., Ltd.
Diesel engine and generator.—Willans & Robinson.
Telegraph poles.—Siemens Bros. & Co., Ltd.
Switchboard, &c.—Siemens Bros. & Co., Ltd.
Telephone apparatus.—Siemens Bros. & Co., Ltd.

OFFICE OF WORKS.

Electric wire and cable (1912-13).—Liverpool Electric Cable Co.; Siemens Bros. & Co., Ltd.; Callender's Cable and Construction Co., Ltd.
Engineering work, Pekin Legation.—Siemens Bros. & Co., Ltd.
Electric crane at Stationery Office, Shepherdess Walk.—R. Waygood & Co., Ltd.
Electric goods lift at ditto.—Easton Lift Co., Ltd.

GENERAL POST OFFICE.

Two electric lifts at Post Office Telegraph Stores, Birmingham.—R. Waygood and Co., Ltd.
Telephone Exchange equipment at Hammersmith, East Ham and New Cross, S.E.—The Western Electric Co., Ltd.
Protective apparatus.—Gambrell Bros., Ltd.; International Electric Co.; Spagnoletti, Ltd.
Telephonic apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L.M. Ericsson Manufacturing Co.; Western Electric Co., Ltd.
Telephonic cable.—W. T. Henley's Telegraph Works Co., Ltd.; Western Electric Co., Ltd.
Wood arms.—Millar's Timber and Trading Co., Ltd.; Western Electric Co., Ltd.
Insulators.—Bullers, Ltd.; Doulton & Co., Ltd.; Taylor, Tunnicliff and Co., Ltd.
Telegraphic ironwork.—Baldwin's, Ltd.; F. W. Cotterill, Ltd.; Phœnix Bolt and Nut Co.; Portland Bolt and Nut Co., Ltd.; C. Richards & Sons.
Telegraphic wire.—Johnson & Nephew, Ltd.; Rylands Bros., Ltd.; F. Smith and Co. (incorporated in the London Electric Wire Co. and Smiths, Ltd.); Whitecross Co., Ltd.
Telephonic wire.—T. Bolton & Co., Ltd.; British Insulated and Helsby Cables, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated in the London Electric Wire Co. and Smiths, Ltd.).

G.P.O.—Messrs. Clough, Smith & Co., Ltd., have secured from the G.P.O. the London-Weybridge—Guildford Section 1 Contract, for the laying of about six route-miles of conduits.

Newcastle-on-Tyne.—The City Council, on 17th inst., sealed the following contracts :—

Titan Trackwork Co.—Tramway junctions, £970.
Lorain Steel Co.—Tramway junctions, £1,328.

New Zealand.—The Te Kuiti (N.Z.) Borough Council has accepted the tender of Messrs. A. & T. Burt, of Dunedin and Auckland, for the installation of an electric light and power plant with a capacity of 100 H.P., to meet the requirements of 7 miles of streets, the contract price being £5,495. "A special condition of the specifications was that aluminium cables should be used instead of the usual copper cables, the price of the latter having risen considerably during the last few months. Although there were four tenderers, only two quoted for aluminium cables."—*Australian Mining Standard.*

Rawtenstall.—The T.C. has accepted the tender of Messrs. S. S. Stott & Co., Ltd., for an elevator for the sand drying apparatus at the tramway depôt.

Southend-on-Sea.—The T.C. has accepted the tender of Belliss & Morcom, Ltd., of Birmingham, for a 500-KW. steam generating set.

(*Continued on page* 666.)

ELECTRICITY SUPPLY DEVELOPMENTS AT BRADFORD.

(*Concluded from page* 622.)

Turning to the switchgear in the No. 2 station, it is interesting to note that this has practically all been built up by the department itself in the well-equipped workshop attached to the station. The direct-current gear is distributed on the ground floor and two galleries facing the original No. 2 engine room, and probably the most attractive feature here is the direct-current remote-control benchboard, fig. 6, for the 1,000-kw. units in the adjacent station.

Each of the bench panels is fitted with two controllers operating the main circuit-breakers, positive and negative, on the upper gallery, and indicating lamps showing the positions respectively of the inter-connector switch (lighting or traction) and circuit-breakers; there is also a voltmeter, a controller for regulating the motor-driven face plates of the field rheostats, which are adjacent to the machines in the No. 3 station, and five solenoid-controlled push buttons—two for signalling the hand control of the rheostat if the power control fails, and the others for engine signals. In each case the driver's return signal is provided by the push button springing out again.

Fig. 10.—Direct-current Feeder Panels for General Supply.

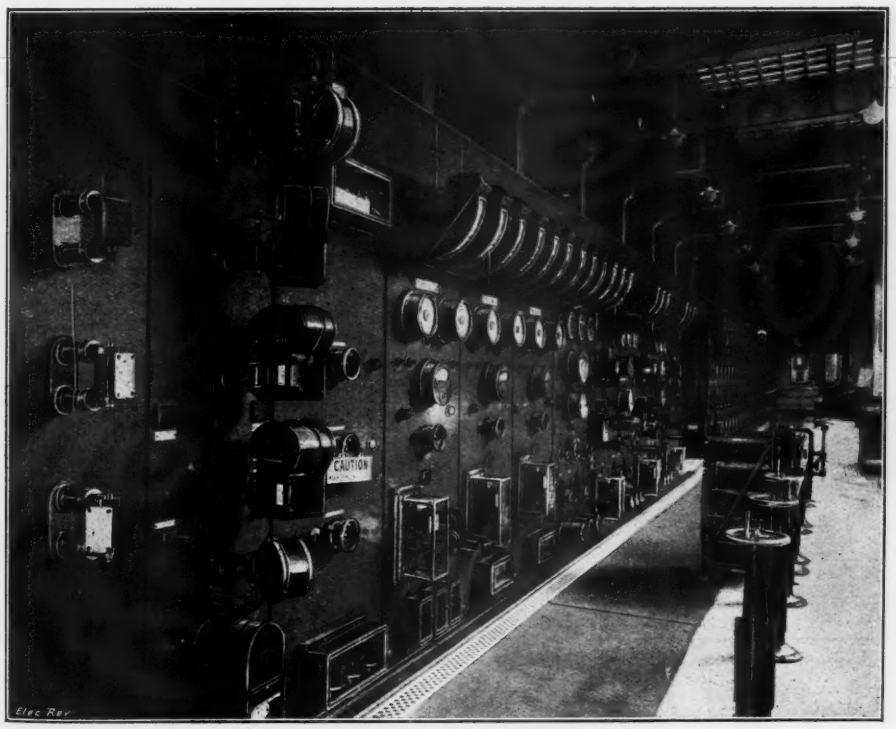


Fig. 11.—Extra-H.T. Machine Panels, with Direct-current Switchgear beyond.

The signal lights are run off a small battery, while the control circuits are operated by 240-volt current from the station bus-bars.

On the upper gallery four positive and four negative 3,000-amp. Westinghouse circuit-breakers are installed in slate cubicles, and behind them panels carrying Thomson wattmeters and circuit-breaker relays, set for instantaneous operation on reverse and allowing an 8 sec. lag on overload. The large circuit-breakers are coupled to the generators through 1·6 sq. in. concentric cables and change-over switches.

The switch panels on the ground floor include 12 machine panels for the Willans sets, also 12 traction feeder panels of normal type; a panel containing paralleling switches, and another containing three master traction meters in series and Kelvin feeder logs. An Aron meter is also provided in the traction negative as a check on the above three meters.

Nine traction negatives enter the station, and are coupled to a main vertical bus-bar; shunts are provided to each of the former, coupled through a sliding contact to an ammeter, also a main shunt for the Aron meter, so that return current readings can be readily obtained.

The first gallery contains the general direct-current supply panels, including 21 positive and 21 negative feeder panels, also interconnecting panels (lighting and traction) and positive and negative switch panels for turbo-alternator field excitation. Fig. 10 shows the extent of this gallery which continues into the A.C. annexe, where it carries certain extra-H.T. switchgear.

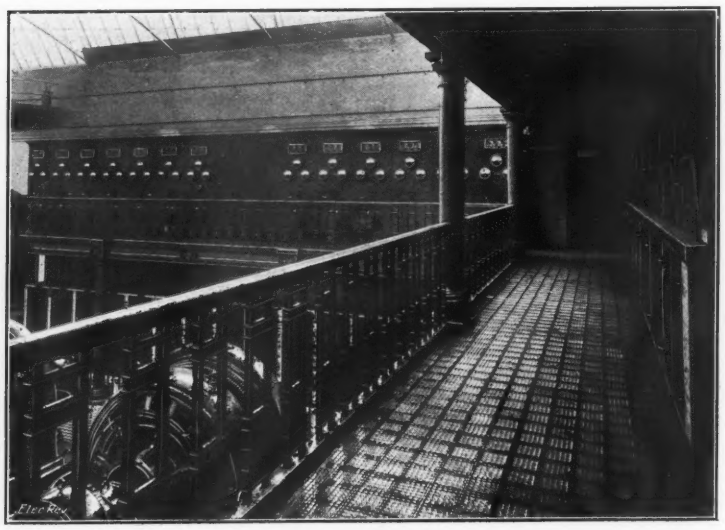


Fig. 12.—Extra-H.T. Switch Galleries in the Annexe.

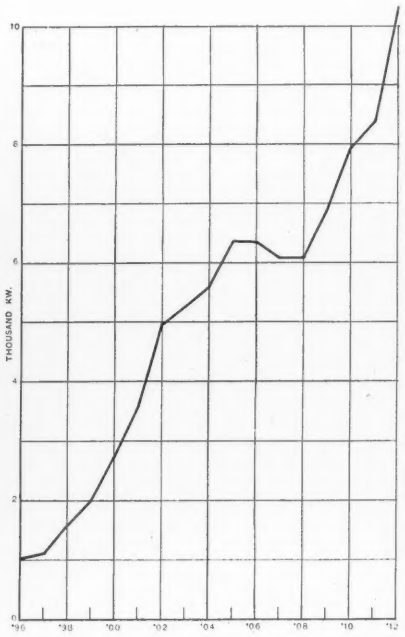


Fig. 13.—Maximum Load Curve.

The panels are arranged for two or three feeders, which are controlled through knife switches and Peard fuses, the latter arranged either singly or two in parallel, so that one can be disconnected during light load; a Kelvin feeder log for recording pressure and current is fitted at the top of the panel for each feeder, and in the lower portion sockets and plugs for coupling to either of three bus-bars behind the board. The feeder logs are all driven electrically from a master clock on the ground floor. The design and construction of this extensive array of switchgear — both mechanically and electrically—is a credit to the electricity department, which carried out the work; the galleries are spacious and tiled with glass, and the greatest care has been bestowed on the detail constructional work behind the panels.

As regards the alternating current plant, the annexe already referred to contains three 500-KW. Westinghouse motor-generators (fig. 14), linking up the A.C. and D.C. supplies; each consists of a 750-H.P., 460-560 volts, compound-wound motor, driving a 500-KW., 6,000-6,500 volts, three-phase, 50-period, generator, at 300 R.P.M. Each motor-generator set has a D.C. compound-wound exciter for energising the fine wire coils of the motor, and a D.C. booster for traction purposes. The generators are separately excited from the lighting bus-bars. A starting rheostat is provided for each motor-generator set, also a field rheostat for each motor-generator, exciter and booster. A large addition to this plant will shortly be made in the shape of a 1,500-KW. rotary converter with an A.C. booster, which is on order. The switchgear for controlling these machines, the three turbo-alternators in the No. 3 station, and 13 outgoing A.C. feeders, is installed along two sides of the building.

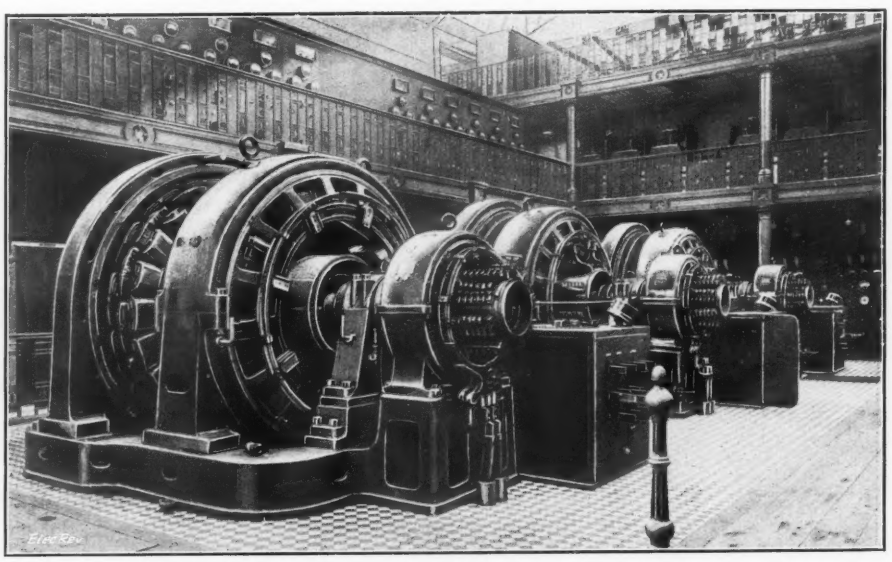


Fig. 14.—Interior of the A.C. Annexe, Showing Motor-Generators and Switch Galleries.

The control panels for the machines are arranged at floor level, with Ferranti oil switches on the gallery above, coupled through isolating links, in cells behind, to bus-bars on the top gallery.

The motor-generator and turbo-alternator panels are equipped with both KW. and power-factor meters, while the

latter also contain in addition, the main switch controller, three single-phase ammeters, an Aron meter, the handle for adjusting the motor in connection with the turbine governor, a Merz-Price relay and four-signalling solenoid press buttons communicating with the turbines, which, of course, are a considerable distance away. For this reason the Merz-Price protective gear has been fitted in connection with the leads running to these machines.

The remaining panels are for synchronising and section switches.

The remote control circuits for these panels are energised from the station direct-current bus-bars; we may mention incidentally, that a stand-by battery will shortly be installed in an adjacent building which has been prepared for that purpose, and which will be arranged to automatically supply the alternator excitation and auxiliary direct-current circuits in the event of failure of the normal direct-current supply.

The feeder switchgear is somewhat different from the foregoing, the control panels being arranged on the gallery, fig. 12, with the bus-bars in cubicles behind, and mechanically-operated G.E.C. oil switches in cubicles at floor level below.

Ferranti overload relays are fitted on each feeder panel with indicating lamps to show which of the relays operate, attention being forcibly drawn to this by a loud sounding bell operated through a relay on the panel. All the H.T. cells are provided with red and green indicating lamps inside, which show at any time whether the cells are in use or not.

A feature of the station is the fine cable basement into which the bare conductors from the switchboards above pass, and are coupled through sealing boxes to the main feeders; the latter are lead covered six-core cables, three pilot cores being included. The cables are arranged in tiers, and supported on racks, with a view to accessibility.

As previously indicated, the department possesses well-equipped fitting and joiners' shops at Valley Road capable of dealing with the bulk of the repair work; a works chemist is regularly engaged in the testing of coal, oil, feed-water, &c., and comprehensive records are kept of everything which may tend towards the efficient working of the department.

The running load factor on the direct-current plant averaged 87·3 per cent., and on the alternating-current plant

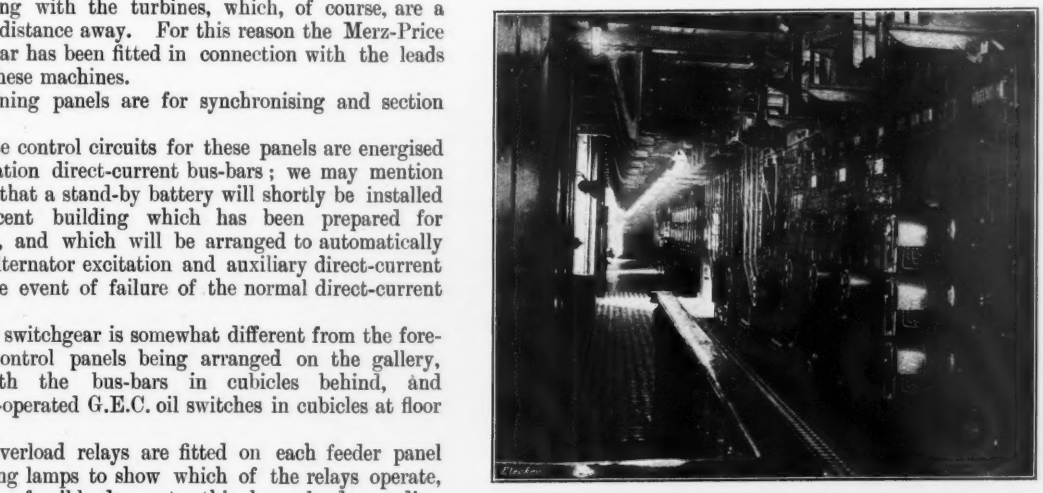


Fig. 15.—View Behind Switchboards.

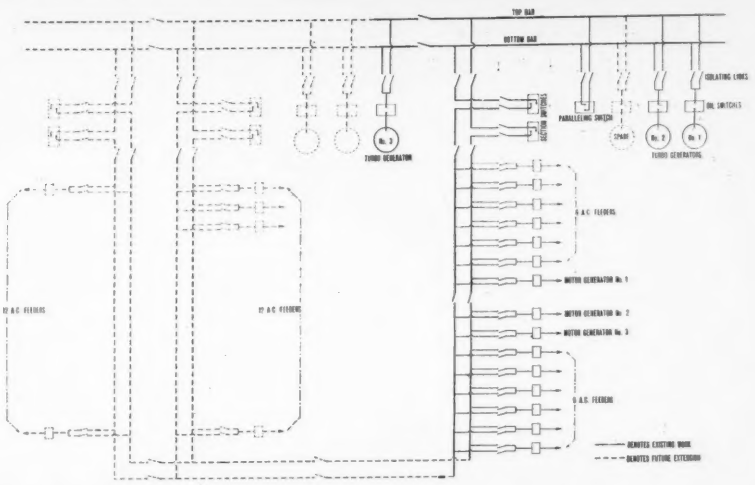


Fig. 16.—Skeleton Diagram of E.H.T. Connections, Valley Road Station.

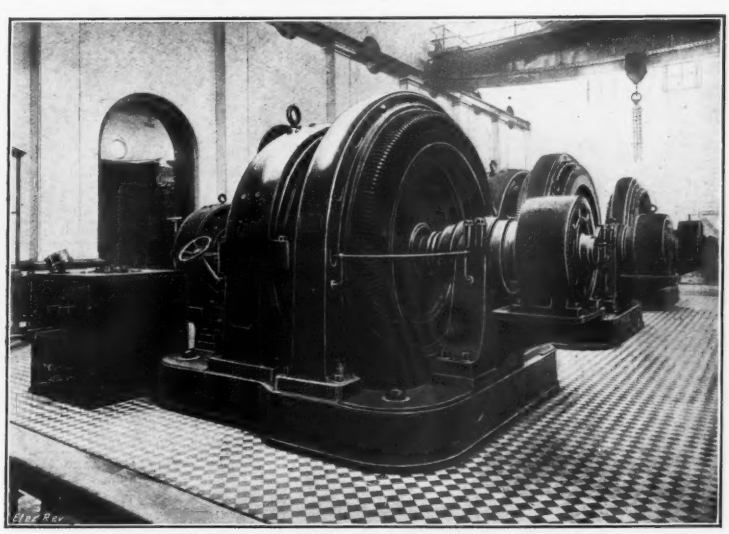


Fig. 17.—500-kw. Motor-Generators, Valley Road Station.

61·48 per cent. for the last year, the station load factor being 24 per cent., although load factors of 40 per cent. and over are obtained during winter weeks. The fuel cost for the year averaged ·15d. per unit sold, with coal costing about 10s. per ton.

The Valley Road plant operates in conjunction with a 3,000-ampere-hour battery, with balancing and booster plant, which represents the present equipment of the Bolton Road (No. 1) station, and with a small plant at the Sunbridge Road Destructor Works, where a 300-kw. generating set with a battery and a 250-kw. rotary converter are installed for tramway supply—the total capacity of plant installed at the Corporation stations amounting to 16,830 kw.

Some 230 miles of cables, mostly armoured and laid direct, are in use, including 48 miles of 6,600-volt three-phase mains, which supply 20 sub-stations and transformer chambers in the area.

All the larger power consumers are supplied through the three-phase system, and the department is gradually transferring all the outer areas, more than 1½ miles from the centre of the city, to the alternating system (230 volts, single-phase, for lighting, and 400 volts, three-phase for motors).

Altogether some 4,000 kw. of Westinghouse and Brush transformers of the oil-cooled type have been installed in sizes varying from 50 to 312 k.v.a., the

usual arrangement being a single transformer for commercial supply and duplicate transformers in the case of a district net-

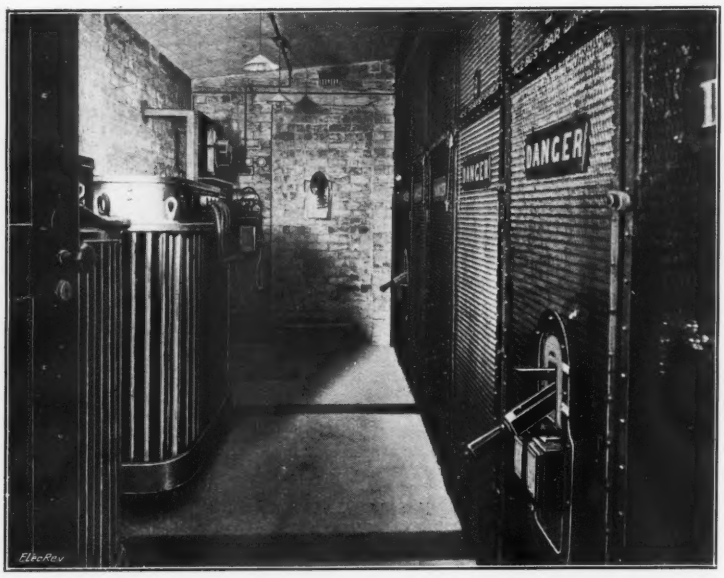


Fig. 18.—Typical Transformer Chamber, Bradford.

work. We illustrate in fig. 18 a typical sub-station equipped with duplicate 145-K.V.A. transformers fed through two three-core ·05 feeders. The equipment includes on the E.H.T. side Westinghouse oil switches and isolating links for the feeders, and A.E.G. oil fuses or oil switches with a series trip and isolating links for the transformers, while the L.T. distributors are controlled by Reyrolle switch-fuses, a Reason demand indicator being fitted.

The E.H.T. switchgear is installed in cubicles, one of the latter containing bus-bar sectioning switches, so that one-half of the switchgear can be laid off for inspection. A telephone is provided in each chamber, also a maximum thermometer, and the latest chambers have a ventilating chimney.

Supply Developments.—No account of the Bradford electricity undertaking would be complete without some reference to the energetic development of the supply for all purposes which has been such an important feature of its administration under Mr. Thos. Roles, the present chief engineer. The enterprise which was responsible for the inauguration of the first municipal electricity supply in Britain in 1889, has a counterpart in the skilful organisation which is to-day attacking the greatly extended supply problems of the present time.

The progress of the department is exemplified by the load curve, fig. 13, the upward tendency of which is more pronounced than ever, due to the greater willingness of large power users to avail themselves of municipal power.

It is interesting to note that the temporary falling off in 1906-8 is traceable to the price of power units for small users, being increased from 1d. to 1¼d., a proceeding which led to the introduction of small gas engines by various consumers, but which were discarded when the normal charges were resumed. Some striking figures connected with the supply, from 1908, the year when "bulk supply" was commenced to the present year, are given in tabular form (p. 665), from which the popularity of this class of supply can be seen. Any consumer having not less than 100 KW. maximum demand is classed under the above heading and allowed to use current for any purpose, including lighting, at power rates.

Under "domestic supply" it will be noticed that the special private residence rate of 15 per cent. on the rateable value plus ½d. per unit, is attracting numerous consumers—some 365 being connected at March, 1912, with an actual average consumption for the year of about 1,000 units each. These figures indicate the popularity of this system in Bradford, but Mr. Roles points out that they refer as yet to only lighting and heating (electrical cooking, for reasons mentioned later, contributing, as yet, insignificantly to the total) and show that such consumers use electricity throughout their houses for the purposes mentioned. In fact, we gather that it is easy to distinguish a consumer on this system by the extent of his illumination at night.

Electric heating has been facilitated by the Corporation offering cheap convectors and radiators, simply and plainly constructed, to the design of the electricity department, and some idea of the scope of this business is gathered from the fact that in a recent week, 75 KW. of such apparatus was supplied.

Although both the special bulk and domestic supply rates, no doubt, temporarily influenced the figures under "private lighting," as shown in the table, yet the indications are that private lighting is going ahead as rapidly as before their introduction, and there can be no doubt that the consumer greatly appreciates any departure from the hard-and-fast tariff. The adoption of electric cooking in Bradford and West Yorkshire generally has been hindered owing to the local custom of baking bread at home, a purpose for which the average electric stove has not been designed. We gather, however, that Mr. Roles has succeeded in inducing one or two makers to meet the demand for a suitable stove for the purpose, and that these will shortly be introduced. An extempore electric stove

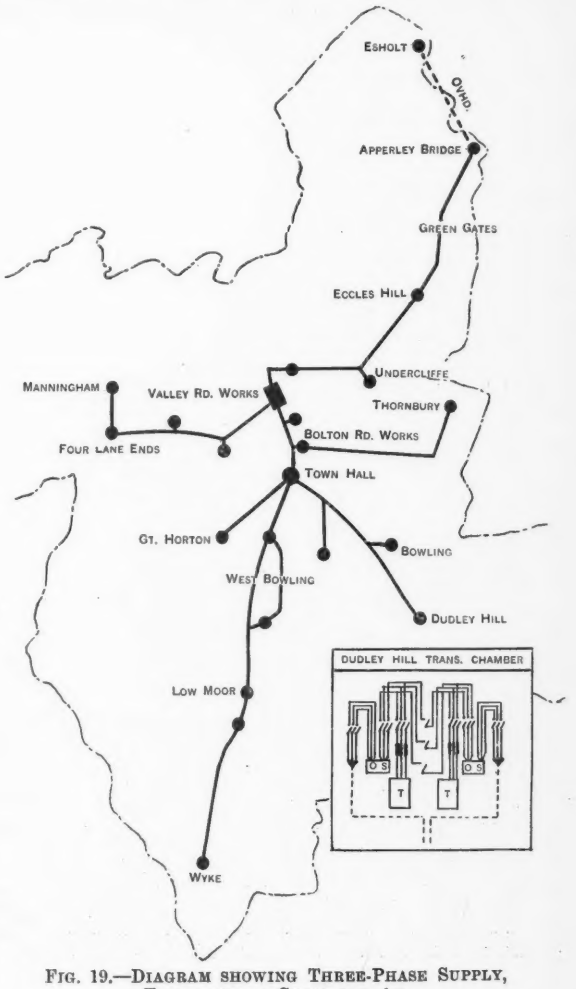


Fig. 19.—Diagram showing Three-Phase Supply, Transformer Chambers, &c.

is used at the mess room at the works, and although a gas stove is installed and equally available, the caterer uses the former exclusively, because it pays him

better. The electricity department runs a well-equipped showroom for the convenience of consumers, in connection with its offices at the Town Hall; the client's contractor, however, receives the trade discount in the case of all apparatus sold through the department.

But it is in the direction of "bulk" supply for power purposes, in connection with the textile and other local industries, that the greatest progress is being made at the present time.

To bring conviction to the mind of this class of consumer has required some years of strenuous effort, which, however, is now resulting in good business. The following list of installations is some indication of the trend of events :—

Bradford Dyers' Association, Ltd., dyers, Thornton Road	1,600 H.P.
*Roby, Clifford & Co., worsted spinners, Wyke	500 H.P.
Ed. Ripley & Son, Ltd., dyers, Bowling	500 H.P.
Mitchell Bros. (Bfd.), Ltd., worsted spinners, combers, &c., Manchester Road	450 H.P.
*H. & J. Gaunt, woolcombers, Valley Road	250 H.P.
*Conditioning House, conditioning, Canal Road	130 H.P.
*John Emsley & Co., worsted manufacturers, Parkside Road	200 H.P.
*Arthur Robertshaw, worsted manufacturers, Bullroyd Lane, Four Lane Ends	100 H.P.
F. Ripley & Co., Ltd., worsted spinners, combers, &c., Thornbury	100 H.P.
*Charles Sykes & Co., manufacturers, Willowfield Mills	70 H.P.
*Ward & Henry Holroyd, silk and worsted manufacturers, Bankfoot	60 H.P.
*Woodhouse Carter, Ltd., silk manufacturers, Low Moor	50 H.P.
Total	4,010 H.P.

* These premises it is interesting to note have no main chimney stacks.

Messrs. Ward & Holroyd have adopted the individual drive, about 100 looms being equipped with Siemens motors; at Messrs. Emsley's mill 350 looms are group driven from seven motors with chain drives on to shafting running at 200 R.P.M.—an increase on the usual speed of 140 to 160 R.P.M.

In this case the looms, each fitted with electric "knock-off" motions, are driven by pairs through half-turn belts, and exactly half the shafting originally proposed, has been dispensed with. Ventilation is provided by 14 24-in. reversible fans; electric cookers and water boilers are provided in connection with the catering for the workpeople, and some 800 lights are installed. Messrs. Emsley expect to obtain a considerably increased output as the result of the electric drive; another "electric driver" on the list, recently declared in public that he had obtained both improved quality and increased output as the result of his venture.

At one of the mills supplied, some 10,000 spindles are driven from shafting running at 750 R.P.M., the drive being through half-crossed belts.

In West Yorkshire, on the average, three silk or worsted looms, or one heavy loom and shafting, require a horse-power for driving purposes, and the usual load factors for such textile establishments vary from 30 per cent. in worsted spinning, 22 per cent. in a woollen mill, and 15 to 18 per cent. in weaving, to 50 per cent. in a wool-combing establishment when running, which is usually during only a period of the year.

Units sold for the year :—	1908.	1909.	1910.	1911.	1912.
Bulk supply	405,134	2,186,008	3,578,171	4,229,338	4,908,997
Private lighting	2,887,969	2,777,386	2,717,315	2,748,392	2,843,163
Domestic supply	—	—	—	106,376	338,590
Public lighting	143,542	132,911	134,410	117,254	97,980
Motive power and heating	2,657,664	2,401,482	2,725,858	3,321,545	3,822,385
Tramways—Day supply	8,905,270	9,421,368	9,440,394	9,604,736	9,927,237
„ Night supply	117,680	143,300	141,709	137,530	164,660
Total	15,117,259	17,062,455	18,737,857	20,265,171	22,103,012
Number of consumers	2,344	2,439	2,570	2 967	3,295
Number of motors connected	1,445	1,510	1,545	222 B. supply 1,683	378 1,862
B.H.P. of same	6,817	7,209	9,582	7,438 2,806 B. supply	8,158 4,571
Route miles of cable laid at end of year :—					
General supply feeders, D.C.	24¾	26	26¾	27¾	24·5
General supply distributors, D.C.	105	107¼	110	114½	63
Tramway feeders, D.C.	72¼	72¼	72¼	72½	18
A.C. feeders and distributors	—	—	—	—	118
Total	202	205½	209	214¾	223·5
Maximum combined load in KW.	6,087	6,884	7,922	8,371	10,314

One of the difficulties in connection with the introduction of mill driving in this area is the practice of letting off "room and power" in the mills, which frequently have numerous tenants dependent for power on one main engine. It may be mentioned that the power rates in Bradford are based on £3 per KW. of maximum demand plus ½d. per unit used, but discounts varying from 2½ per cent. to 50 per cent.—the latter for over 350 KW.—reduce this price to a figure which appears very attractive to the large user. Unfortunately the maximum demand restriction, though technically fair, is inadequate to meet the conditions existing in some trades, and possibly, from the users' point of view, also inequitable; a corporation is, moreover, unable to quote a "lump sum" contract price, although there is no doubt that many consumers would prefer this method of doing business, even though it actually cost them more.

In conclusion, we are indebted to Mr. Thos. Roles, the city electrical engineer, and to his several assistants, for affording us the fullest information on the occasion of a very interesting visit to the "woollen" city.

Alternating-Current Trolley 'Buses. — The first trolley 'buses to employ alternating current were recently placed in operation at the Leipzig Exhibition. Each 'bus is equipped with a 10-KW., 110-volt, 50-cycle motor of the repulsion type, which type has the great advantage of starting and speed control by simple variation of the brush setting. The motor is connected through an elastic coupling to a 10 : 1 gear reduction driving the rear axle of the 'bus. The original paving of the route being very uneven, a strip of macadam 40 ft. in width was laid, and the interstices filled in with tar. It will be interesting to observe how the new 'buses compare with the direct-current types now in use in this country and on the Continent, as regards convenience of operation, running efficiency and maintenance costs.

A German Patent Action.—An action which has been pending for some years past between the A.E.G. and the Swiss firm of Brown, Boveri & Co. has now been finally decided by the Imperial Court at Leipzig in favour of the latter. The case refers to the arrangement of the winding in the inductors of high-speed machines. The A.E.G. obtained a licence for this arrangement from the Swiss company, but during the course of manufacture, the former made certain alterations, which were patented, and came to the conclusion that the machines did not fall under the Brown, Boveri patents. With a view, however, to settling the question, the A.E.G. instituted a patent action, which has resulted as already mentioned. It is now stated that the A.E.G. intends to alter the turbo-generators so that they will not come under the Swiss company's patents, whilst at the same time retaining the characteristic properties of the A.E.G. types. It is calculated that the arrears in licence royalties extending over eight years, and which will have to be paid, amount to over £50,000.

CONTRACTS CLOSED.

(*Continued from page* 660.)

London.—Hammersmith.—The B.C. Electricity Committee has accepted the tender of Messrs. W. Cory & Son, for Seven Sisters Hard dry coal, at 13s. 9d. per ton for 12 months, and that of the Main Colliery Co., for "Graigola and Victoria" free-burning coal at 16s. 6d. per ton for six months.

Fulham.—The B.C. has accepted the tender of Messrs. Cory Bros. & Co., and Messrs. Phillips & Co., for 3,000 tons of Gedling nutty slack, at 12s. per ton, and 2,000 tons of Kirkby ditto, at 11s. 11d. per ton, respectively, for use at the electricity works.

The Metropolitan Water Board has accepted the tender of Messrs. Veritys, Ltd., for tape, cable, &c.

The tenders of the General Electric Co., Ltd., and Messrs. Falk, Stadelmann & Co., Ltd., have also been accepted for supplies of a quantity of electrolier wire and fittings accessories, the former at £129 for the fittings, and the latter at £27.

Taunton.—The T.C. has accepted the tender of Messrs. C. Goodland & Sons, of Taunton, for main colliery through-and-through steam coal for the electricity works, at 17s. 3d. per ton.

York.—The tender of the Electrical Apparatus Co., Ltd., for the supply of meters up to and including 5 amperes capacity for the Corporation, has been accepted for the year ending September 30th, 1913.

Car meters supplied by Messrs. Venner & Co. are now being installed on the tramways here.

FORTHCOMING EVENTS.

Physical Society.—Friday, October 25th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "The Constitution of Mercury Lines Examined by an Echelon Grating and a Lummer-Gehrcke Plate," by Prof. H. Nagaoka and T. Takamine; "Note on the Mutual Inductance of Two Co-axial Circular Currents," by Prof. H Nagaoka; and "The Absorption of Gas in Vacuum Tubes," by Mr. S. E. Hill.

Institution of Mechanical Engineers.—Friday, October 25th. At 8 p.m. Paper on "Characteristic Dynamical Diagrams for the Motion of a Train during the Accelerating and Retarding Periods," by Prof. W. E. Dalby; and paper for discussion, in writing only, on "Theory and Experiment in the Flow of Steam through Nozzles," by Prof. J. B. Henderson.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 25th. At 7.30 p.m. At the Lit. and Phil. Society, Newcastle-on-Tyne. Annual general meeting. Inaugural address by the Hon. Sir C. A. Parsons, president.

(Graduate Section).—Saturday, October 26th. At 7.15 p.m. At Bolbec Hall, Newcastle. Address by Mr. L. E. Champness, chairman.

Association of Engineers-in-Charge.—Saturday, October 26th. At the Holborn Hall. Whist drive and dance.

Great Central Debating Society.—Saturday, October 26th. At 6 p.m. At the Grand Hotel, Leicester. Lecture on "The Economics and Advantages to be Obtained by the Institution of Goods Clearing Houses, Suitably Designed, and Adequately Equipped and Approached," by Mr. A. W. Gattie.

Junior Institution of Engineers.—Saturday, October 26th to Monday, October 28th. Week-end visit to the works of Messrs. T. Firth & Son, Ltd., and Messrs. Cammell, Laird & Co., Ltd., Sheffield.

Institution of Electrical Engineers (Manchester Local Section).—Friday, November 1st. At 7.30 p.m. At the Midland Hotel, Manchester. First meeting of the session. Address by Mr. A. A. Day, to be delivered by Prof. E. W. Marchant, vice-chairman.

NOTES.

London Traffic.—In the Parliamentary Papers recently Capt. Jessel asked the Home Secretary whether the Government would bring in a Bill to set up a traffic board in accordance with he recommendation of the Royal Commission of 1905.—Mr. McKenna, in reply, said that he would consult his colleagues at the Board of Trade and the Local Government Board in the matter, but he did not at present see much prospect of Parliament having time to discuss legislation on the subject.

Protection from X-rays.—In a communication to the Academy of Sciences of France, M. Droit describes a new device for the protection of X-ray operators from radiodermatitis, consisting of silk tissues impregnated with phosphoric acid 8 per cent., tin oxide 44 per cent., and lead oxide 34 per cent.; gauntlets made of this material six layers in thickness afford effective protection.

Concert.—On Wednesday night last week, at their clubhouse, Howe Bridge, Atherton, a concert was given by employés of the South Lancashire Tramways Co., under the presidency of Mr. E. H. Edwardes, general manager, who was supported by Mr. H. B. Conibear, secretary, and Mr. W. Lancaster, traffic superintendent.

Swedish Trade in Spain.—Two of the leading members of the Allmänna Svenska Elektriska A.-B. have set out for Spain in order to form a branch to promote that firm's considerable interests both there and in Portugal.—*Affärsvärlden.*

Copper.—Stocks in France and England and afloat are shown by Messrs. Merton's statistical circular to be 809 tons less at the half month, *i.e.*, October 15th than at the end of September. Of this, England has reduced stocks by 534 tons, while France has increased by a larger amount, the reduction on the whole quantity being made by the reduced consignments afloat. The total European visible supply, including Rotterdam and Hamburg, was 1,171 tons less on October 15th than on September 30th. Deliveries for the half-month were normal from North America, very low from Spain and Portugal to England and France, the quantity to other countries being above the average: Chile shipments were well up, and Australian high. The total European deliveries, at 20,972 tons for the half-month, show a normal amount of business, if repeated in the remaining half-month. The stock in American producers' hands at the end of September was 28,155 tons, an increase over the stock for the end of August of 7,306 tons, which puts this quantity higher than for any month since last April. The total visible supply from all known sources for the end of September was 76,100 tons, showing an increase, over the end of August, of 4,919 tons.

Tungsten Lamp Contracts.—The following letter came to hand too late for inclusion in our "Correspondence" columns:—

"Having seen Form F.T.C., relating to trade contracts for tungsten lamps, and observed its several conditions, which are binding upon the buyer, who, in most cases, will be the electrical contractor, it appears a most unjust clause, prohibiting the buyer to advertise, stock or solicit orders for tungsten lamps other than those manufactured by the companies in the Tungsten Lamp Association, whose names are given on Form M.L., dated September 30th last.

"There are other manufacturers of tungsten lamps in this country who have considerable interests at stake, and whose lamps have secured a reputation for efficiency and reliability, and it seems unfair that buyers should be precluded from dealing with such firms, whose lamps have been proved by experience and trial to be equal in every respect to the so-called Association lamps.

"Contractors should be in a position to supply any make of tungsten lamp which would give satisfaction to their client, without any restriction, and in view of the small additional advantage offered by the Association to buyers signing the contract form, surely contractors should prefer to have liberty in purchasing where they think fit, by the non-acceptance of the conditions set out in the form of contract. Justice.

"*October 21st*, 1912."

The Electrical Trades Benevolent Institution: A Dramatic Performance.—On Saturday, November 16th, at 8 p.m., the Garrick Dramatic Society will give a performance of the "Second Mrs. Tanqueray," at the Royal Court Theatre, Sloane Square, S.W., in aid of the funds of the above Institution. This will be the first production by an amateur company of Sir Arthur Pinero's play. It will be under the stage direction of Mr. T. Ireby Cape, and the society's orchestra will be under the direction of Mr. Robert S. Kerr. The prices of admission will be as follow:—Orchestra stalls, 10s. 6d.; dress circle, 7s. 6d.; upper circle, 4s.; pit stalls, 3s.; gallery, 1s.; and private boxes by arrangement. It is hoped that there will be many demands from among our readers for tickets, as it is desired that the Benevolent Fund shall benefit largely by the event. Tickets can be obtained on application to the Secretary, Mr. F. B. O. Hawes, 18, Park Mansions, Vauxhall Park, South Lambeth Road, London, S.W., or to Mr. Leonard G. Tate, Secretary of the Electrical Contractors' Association, 20, Bucklersbury, London, E.C. If every one of our readers were to 'phone or write one of these gentlemen ordering tickets they would have very real evidence of the interest which electrical men take in an effort to swell the funds of a very deserving institution. "Do it now!"

Bradford Wiremen on Strike.—The Bradford wiremen are on strike for an increase of pay. They maintain that they are paid less than similar workers in other towns, and demand an increase from 8d. to 9d. an hour. The employers do not admit the correctness of the statement that the pay in Bradford is unusually low. Mr. Kinneburgh, the organising secretary of the Electrical Trade Union, is in Bradford in control of affairs on the men's side. A conference between representatives of the Union and of the Bradford Electrical Contractors' Association took place on Wednesday evening last week with a view to the possibility of coming to an amicable agreement, and the employers agreed to consider the case as presented by the men, and give their decision in due course. On Thursday the employers notified the men that, after careful consideration, they regretted that they could not accede to the demands, but they would be quite willing to submit the matter to the arbitration of the Board of Trade. The men, after a long discussion, rejected the offer. In the meantime, the wiremen employed by the Corporation, the Bradford Dyers' Association and one or two private firms, in which cases the pay is regarded as satisfactory, are to be allowed to continue work.

Fatalities.—An inquest was held on Saturday into the cause of death of two labourers (Creaser, aged 32, and Goddard, aged 31), who were killed at the Devonshire works of the Staveley Coal and Iron Co., on the previous Thursday. It appeared from the evidence that they were painting some standards, when they came into contact with a 6,500-volt live wire, and both died as the result of extreme burns and shock. There were notices some 30 yards from where the deceased were working, warning of danger and Creaser had been personally warned, and told that the work had better be done on Sunday when the current was off. The jury in returning a verdict of "Accidental Death," recommended that the Staveley Co. should be asked to fix warnings on the standards, and that the painting of the pillars should be done on Sundays!

Tide Utilisation.—As was reported some time ago, a scheme has been prepared by a Hamburg engineer (E. Pein) for the utilisation for power purposes of the ebb and flow of the tide at Husum, in the North Sea. As doubts have been entertained in various quarters as to the practicability and economy of the project, a water-power installation company has been formed at Hamburg to erect an experimental plant at Husum, of 10 H.P., to test the system.

A Large Air Pump.—Messrs. Richardsons, Westgarth and Co. recently gave, at their Hartlepool works, a demonstration of a large kinetic air pump, designed for use with a 12,000-KW. steam turbine. With ejection water at 72° F. and barometer 30 in., a vacuum of 29·8 in. was obtained when air was admitted by a 4-mm. hole and a vacuum of 28·3 in. when air was admitted by a 14-mm. hole, equivalent to approximately 66 cb. ft. of free air per minute at 60° F. It is believed that this establishes a record.

Organisation of Employers.—The movement for better organisation of employers to meet the increased efficiency in the organisation of Labour, is spreading. The Employers' Parliamentary Association is at present carrying on a campaign in this connection. Nottingham employers were addressed by the president of the Association (Sir Chas. Macara) last week, and they gave their support to the movement.

Institution and Lecture Notes.—Institution of Electrical Engineers (Yorkshire Local Section).—The first general meeting of this Section will be held at the Hotel Metropole, Leeds, on Wednesday, November 6th, when Mr. S. D. Schofield, the chairman, will deliver his inaugural address. A smoking concert will follow. Subsequent meetings of the session will take place on the following dates: At Leeds—December 4th, January 15th, February 12th, March 12th, April 16th and May 14th. At Sheffield—January 29th, March 26th and April 23rd. This arrangement (seven meetings in Leeds and three in Sheffield) has been adopted as the result of careful consideration of various schemes devised with the object of securing larger attendances at the meetings.

Institution of Post Office Electrical Engineers (Metropolitan Centre).—The following are the events announced for the 1912-13 session:—

Nov. 11th.—"A.C. Measurement, with Special Reference to Telephone Cables, Loading Coils and the Construction of non-reactive Resistances," by C. E. Hay.
Dec. 9th.—"Trunk Telephone Communication, Transmission Schemes and the Design of the Circuits," by A. B. Hart and W. J. Hilyer.
Jan. 13th, 1913.—"The Electrophone Service," by J. H. Pattman.
Feb. 10th.—"Loading Coils," by S. A. Pollock.
March 10th.—"Wireless," by F. Addey.

The meetings are held in the I.E.E. Lecture Hall, Victoria Embankment, W.C., at 6 p.m.

Rugby Engineering Society.—The syllabus of meetings for this Society includes the following:—

Nov. 19th.—"Chain Gearing," by H. T. Hildage.
Dec. 17th.—"The New Diesel-Driven Pumping Plant at Rugby Waterworks," by B. A. Pfleiderer.
Jan. 7th, 1913.—"Large Steam Turbo Units," by J. P. Chittenden.
Feb. 4th.—"High-Speed Bearings," by J. C. K. Balfry.
March 4th.—"Power Transmission by Modern Gearing," by H. H. Thorne.

Institution of Municipal Engineers.—At the annual meeting on October 11th, Mr. Frank Latham was elected president. Amongst the vice-presidents are Mr. H. C. Adams and Mr. H. L. P. Boot. The annual report of the Council shows that the roll at June 30th last numbered 882 members. The excess of revenue over expenditure for the year was £47, and the accumulated balance £234. Examinations were inaugurated in November last.

Institute of Marine Engineers.—Mr. Summers Hunter delivered his Presidential Address at a meeting of the Institute, held on Monday, October 14th, afterwards presenting the Denny Gold Medal, awarded to Mr. John McLaren for his paper on "Wireless Telegraphy," read December 11th, 1911.

American Institute of Electrical Engineers.—As the result of negotiations with other societies, reciprocal arrangements have been made between the Institute and the Institution of Electrical Engineers, as well as the German, French, Italian, Swiss and Dutch electrical societies, which enable members of the A.I.E.E. whilst abroad to enjoy the privileges of members of those societies for a period of three months, and *vice versa*.

Barrow and District Association of Engineers.—The first meeting of the autumn session in connection with this Association was held on October 11th, when Mr. H. R. Burnett, borough electrical engineer, Barrow, delivered his presidential address. A collection of electric heating and cooking appliances was afterwards open to the inspection of the members in the large lecture hall of the Barrow Technical School. This exhibition of the latest developments in electrical apparatus for all domestic purposes was utilised by the Barrow Corporation on the following Saturday afternoon, the general public being invited to attend.

Mining Electrical Engineers (West of Scotland Branch).—In the annual report of this Branch just issued, the list of meetings for the new Session is announced. On Friday, 18th inst., Mr. Matthew Brown delivered his presidential address, and presented certificates to successful candidates. Mr. A. B. Muirhead followed with a paper on "Notes on Electricity Rule No. 7." The later meetings will take place on November 16th, December 21st, January 18th, 1913, February 15th, March 20th, April 17th, and May 15th. The papers will include "Notes on the Electrification of a Group of Small Collieries," by Mr. A. Campbell King; "Variable Speed A.C. Motors," by Mr. S. A. Simon; "Power Transmission," by Mr. W. H. Telfer.

Institution of Electrical Engineers (South Africa).—At a meeting held towards the end of September Mr. E. T. Ewing read a paper on "Some Practical Aspects of Electric Winding," and a paper by Mr. J. Askew on "Practical Operation of the three-phase Hoists at the Bantjes Consolidated Mines, Ltd.," followed. Mr. J. H. Rider presided. At a meeting of the students' section a few days later a discussion on electric traction was continued.

Institution of Electrical Engineers (Scottish Local Section).—The eleventh annual dinner will be held on Tuesday, December 17th, in the Banqueting Hall of the Grosvenor Restaurant, Glasgow. The meetings during the session will be held in the Lecture Hall, 207, Bath Street, Glasgow (four), and at Princes Street Station Hotel, Edinburgh (two). The first meeting will take place at Glasgow on November 12th, when the chairman (Mr. W. M'Whirter) will deliver his inaugural address.

London Association of Foremen Engineers and Draughtsmen.—On Saturday last, the members and friends of this Association inaugurated the winter session of the sixtieth year of the Association with a grand Bohemian concert at the Cannon Street Hotel, E.C. The president (Mr. C. Eggleston) occupied the chair, and some five hundred members and guests greatly appreciated the excellent programme that had been prepared. The syllabus for the ensuing term covers a very wide range, and foremen and others holding positions of responsibility connected with engineering are invited to the Association's meeting on Saturday, November 2nd, at 8 o'clock, at the Cannon Street Hotel, when Mr. William Bell will read a paper on "Refrigeration."

Co-partnership.—"The Human Side of Co-partnership," and "Co-partnership and Efficiency," are subjects upon which Lord Robert Cecil and Sir W. H. Lever will address the Labour Co-partnership Association at Birmingham early next month.

Appointments Vacant.—Chief assistant engineer for the Edinburgh Electricity Department (£400); Charge engineer, for the Ilford U.D.C. Electricity Works (£120); Teacher of practical electric wiring at the L.C.C. School of Engineering and Navigation, Poplar, E. (10s. 6d. per evening); Switchboard attendant, for the Corporation Electricity Works, Lancaster (25s.); Head of the Electrical Engineering and Physics Department, L.C.C. Hackney Institute, London, N.E. (£300); Electrical fitters and armature winders, for H.M. Dockyard, Devonport (36s.); Switchboard attendant and man to take charge of and repair motors and fans, for the Blackpool Tower Co., Ltd. See our advertisement pages in this issue.

Concrete Institute.—A course of six weekly lectures on "Concrete" will be delivered by Mr. H. Kempton Dyson, commencing on Tuesday, November 12th. Particulars and tickets (free) may be obtained from the Secretary of the Institute, 296, Vauxhall Bridge Road, Westminster, S.W.

Charge against a Councillor.—At Liverpool on Saturday last, according to the *Times*, a member of the Wallasey Borough Council was committed for trial (bail £50) on a charge of soliciting a fee of 100 guineas from Mr. J. B. Hutchins as an inducement to do something in respect of the proposed purchase of land from Mr. Hutchins by the Wallasey Council.

Carbide of Calcium.—The report for 1911-12 of the Usines Electrochimiques de Hafslund, of Geneva, which carry on works in Norway for the manufacture of carbide of calcium, states that the market for carbide became steadier during the year, thus favourably influencing the results. The effects of the carbide syndicate formed in the previous year had not been specially manifested, so that the trade still suffered from a certain amount of over-production. The company, which had resumed the manufacture of ferro-silicon, had a turnover of £221,000, and earned gross profits of £45,000, as compared with £25,000 in 1910-11. After allocating £10,000 to depreciation, the accounts showed net profits of £35,000, as against £16,000 in 1910-11, and it is intended to distribute 10 per cent. on the share capital of £90,000. The balance has been partly placed to the reserve fund and partly applied to extra depreciation, leaving £3,900 to be carried forward.

Progress of the Commercial Electric Vehicle.—P. D. Wagoner, president of the General Vehicle Co., Long Island City, N.Y., discussing conditions in the electric commercial vehicle industry, recently said:—"The development of the electric commercial vehicle industry has shown some particularly interesting phases in the past 12 months. Among these may be mentioned the following:—(1) The increase in orders received this year over those in 1911; (2) The wonderful percentage of repeat orders, which in our case in 1911 was 69·4 per cent., and thus far in 1912 is well over 65 per cent.; (3) The encouraging increase in 'small wagon' business, as compared with the situation in previous years when the use of heavy trucks greatly predominated and department stores and retailers favoured non-electrics; (4) The increase in sales to retailers who own from two to six horses and to whom the purchase of even our smallest wagon often meant a heavy initial investment. We have won their confidence, and have shown them that they can make electrics pay as well as the big firms do; (5) The fairer attitude of the public toward the electric; (6) The recognition by business men of the respective fields of the electric and the gasoline vehicle and of the importance of buying the proper vehicle for each class of work; (7) The increase in battery efficiency and the encouraging decrease in the cost of energy to off-peak users. I look for the electric truck and wagon to improve still more in operating efficiency as actual service under varied conditions yields its secrets, with the result that electric vehicles will be handled more intelligently."—*Electrical World.*

Brazilian Government and State Cables.—A correspondent of the *Times* states that the Brazilian Government does not recognise in any way the project submitted to the Chamber authorising the Government to lay coast cables. The Government possesses full knowledge of the rights embodied in existing concessions, which would be infringed by such a scheme, and it intends to maintain them. Therefore, the project will not be carried.

Correction.—In a leaderette in our last issue, entitled "An Important Case as to the Measure of Damages," we summarised from the October "Law Reports" the decision of the Court of Appeal in the case of the British Westinghouse Electric and Manufacturing Co., *v.* the Underground Electric Railways, Ltd. Our readers will, however, in some cases have remembered that in our issue of July 26th last it was reported that this decision had been reversed by the House of Lords. The matter receives further attention in our "Legal" columns to-day. The points of reference were very clearly quoted in our issue of January 20th, 1911, page 89. We are anxious to remove any erroneous impression that our comment of last week may have created.

Electrical Workers' Wages.—At a meeting of the Nottingham Guardians on Tuesday, the House Committee reported that a letter had been received from the Electrical Trades Union asking for an increase of 2s. per week in the wages of the men employed in the electrical department of the workhouse. The Committee had, however, resolved to consult the men and, if they wished it, to place them on a trade union basis in all respects. The acceptance of this would involve loss of holiday, sick leave, and other benefits now granted to them.

Bankruptcy.—The adjourned public examination of Henry Hallifield Oxley (otherwise known as Oliver Huxley), consulting engineer, 22, Uxbridge Road, Hanwell, Middlesex, was fixed to take place at the Court House, Half Acre, Brentford, on October 22nd, but the debtor did not appear. The Official Receiver said that the debtor had said he was in the employ of the British and Foreign Investments Corporation, at a salary. At the last Court the debtor consented to an order setting aside £100 a year for the benefit of his creditors, but the officials of that company informed him that he was not now employed by them. His engagement terminated last July, so that the order made by the Court was not worth the paper it was written upon. Debtor had said that he was employed by the company at £6 per week at the time the order was made; that was incorrect, so he should ask that the case should be adjourned, and the debtor would be invited to explain, and, if possible, complete his examination. The application was granted.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. Thomas Harding, collector, has been presented by Mr. Francis Teague, the city electrical engineer, and his colleagues on the office staff of the Bath Corporation electricity department, with a silver teapot, on the occasion of his approaching marriage.

The Liverpool Corporation Electricity and Tramways Committee received 65 applications from gentlemen of high standing in the electrical engineering world, for the position of Corporation electrical engineer, at a commencing salary of £1,000, increasing to £1,500. Out of that number, nine were selected to appear before the Special Sub-Committee on Monday, when the following were chosen to appear before the full Committee on Tuesday last for final selection:—Mr. John Christie, chief electrical engineer, Brighton; Mr. Harold Dickinson, chief electrical engineer, Leeds; and Mr. Thos. Roles, chief electrical engineer, Bradford. The result of Tuesday's proceedings was that Mr. Dickinson was appointed.

Owing to the amalgamation with Glasgow of the burghs of Govan and Partick, arrangements have been made with the various heads of departments in the service of the local T.C.'s. It is recommended that Mr. T. C. Parsons, the electrical engineer to Govan T.C. should be retained in the service of Glasgow at a salary of his present rate of £500 until Whit Sunday, and given a lump sum of £2,000 as compensation. With regard to Mr. Wm. Sillery, electrical engineer to Partick T.C., his services are also to be retained till Whit Sunday at a salary of £450 per annum, and he is to receive a lump sum of £1,500.

Tramway Officials.—Mr. Hartley, who was for many years inspector on the South Lancashire Tramway Co.'s system at Atherton, has been appointed an Inspector under the Insurance Act.

General.—The *Daily Telegraph* states that at St. Bartholomew's Hospital the vacant post of director of the department for electrical treatment has been filled by the appointment of Dr. E. P. Cumberbatch, M.B., M.R.C.P., to be medical officer in charge. The X-ray department is now managed separately from the department for general electrical treatment, under its own medical officer, Dr. Hugh Walsham having lately been elected to this position.

Mr. John E. Gibbs, motor and electrical engineer, of York, has accepted an invitation from the Conservatives of the Walmgate Ward to contest that area at the forthcoming municipal elections.

Mr. Thos. O. H. Bates, chief electrical engineer at the Rotherham Main Colliery, and formerly of the Morley electricity staff, has accepted the position of electrical engineer to the Tata Iron and Steel Co., of Sakchi, near Jubbulpore, India.

Mr. H. Bettley has resigned the position of electrician to the Ammonia Soda Co., Ltd., at their Cheshire works, to take up the position of resident electrical engineer to the Weaverham and District Electricity Co., Ltd., under the jurisdiction of Mr. A. J. Leigh, of Northwich, consultant and secretary, who has considerable extensions in negotiation.

In order to prevent injury to Mr. Marconi's left eye, it was found necessary to remove the right eye, and this operation was successfully performed on Thursday last week. We are glad to add that the patient is making satisfactory progress towards recovery.

We are officially informed that Mr. John Christopher Mitchell has resigned his position as secretary of the London General Omnibus Co., Ltd, and has been appointed comptroller of the Underground Electric Railways Co. of London, Ltd., and that Mr. William E. Mandelick has been appointed to succeed him.

Mr. H. Bloodworth, formerly of Siemens Bros. Dynamo Works, Ltd., has recently taken up an appointment with the Armorduct Manufacturing Co., Ltd., as country sales manager.

Obituary.—Mr. George Lowdon.—We regret to learn of the death, which occurred on October 17th, at Dundee, at the advanced age of 88 years, of Mr. George Lowdon, scientific instrument maker for 56 years, and a pioneer in Scotland of many scientific discoveries and inventions. He was associated with Faraday, who, it is said, frequently visited his shop, with J. Bowman Lindsay, in his wireless telegraphy experiments, and with Sir David Brewster in making and improving the stereoscope. With Lindsay he was in business association. Among other matters attributed to him are the invention of electrical means for establishing communication between the driver and guard on a train, the first introduction of electric light into Dundee and the first Bell telephone into Scotland, also it is said that, in 1878, he brought forward the first saleable and workable dynamo and lamp in Glasgow, Edinburgh and Dundee. When the electric telegraph came into use, Mr. Lowdon erected the first wires on the Dundee and Perth, Dundee and Arbroath, and Dundee and Newtyle Railways, and he also made the instruments, and instructed the station-masters in the use of them.

Sir J. Irving Courtenay.—We are sure that large numbers of our readers will join with us in regretting the death, which occurred on Tuesday last at St. James's Court, Buckingham Gate, of Sir John Irving Courtenay. Sir Irving's association with the electrical industry began many years ago in association with others interested in pioneering electrical enterprises, and his activities of this kind had been continuous ever since, both at home and abroad. Notwithstanding that he had reached the age of 75 years at the time of his death, his practical interest in the undertakings with which he was connected had led him to visit the River Plate comparatively recently. He was chairman of a large number of companies—electrical manufacturing, electric supply, telephone and tramway—as follows:—Chelsea Electricity Supply Co., Ltd., Electric Construction Co., Ltd., Electrical Power Storage Co., Ltd., Oxford Electric Co., Ltd., United River Plate Telephone Co., Ltd., Cordoba Light, Power and Traction Co., Ltd., and the Cordoba (Argentine) Electric Tramways Construction Co., Ltd., and his experienced grasp of the affairs of these concerns, and the courtesy and freedom with which he always imparted information will be familiar to his shareholders, by whom he will be greatly missed at the meetings of the companies. The deceased gentleman was a member of the I.E.E., and a Fellow of the Royal Geographical Society. He was called to the Bar in 1861, and was made a Knight five years ago.

Mr. Wm. Bottomley.—It is with regret that we learn of the death of Mr. William Bottomley, B.E., a nephew of the late Lord Kelvin, who for many years aided him in the bringing-out of his mariners' compass and nautical sounding machine. Mr. Bottomley's death took place at his residence, 15, University Gardens, Glasgow, on Friday morning, the 18th inst., after a prolonged illness. Mr. Bottomley was a son of the late William Bottomley, Esq., J.P., and was born in 1850 at Fortbreda, Co. Down, Ireland. He was educated as an engineer at Queen's College, Belfast, under the late Dr. James Thomson, F.R.S., who was then Professor of Engineering in the Queen's University of Ireland. His first engineering post was under the late Mr. Alexander Tate, County Surveyor for the County of Antrim, with whom he worked for some years as a civil engineer; and he left this work to take service with Lord Kelvin (then Sir William Thomson) and the late Prof. Fleeming Jenkin in the early seventies, when they were engaged in preparing the Western and Brazilian and the Platino-Braziliera Cables. These cables were constructed at Hooper's Telegraph Works, and at Messrs. Siemens's Works at Old Charlton, where a large staff of young men, some of whom afterwards became well known as telegraph engineers, worked under and along with Mr. William Bottomley in the supervision and testing of the cables. Mr. Bottomley afterwards took part in the cable laying expeditions; and, when the work was completed, he was offered an important permanent post as one of the resident engineers. He preferred, however, to return home, and take part, under Lord Kelvin, in the experimental work connected with the development and perfecting of Lord Kelvin's mariners' compass and nautical sounding machine; and he took entire charge of the not unimportant commercial side of the bringing-out of these inventions. Lord Kelvin's compass and sounding machine were at

first constructed in the workshops of the late Mr. James White; and when, in 1900, the business of Mr. White was converted into Kelvin & James White, Ltd., Mr. William Bottomley was one of the first directors of the Limited Company. He continued to manage the nautical part of the business until Lord Kelvin's death in 1907, when he resigned. Since that time he has been engaged in private work. In 1883 Mr. Bottomley married a daughter of the late Mr. W. H. Barlow, F.R.S., the well-known architect of the Tay Bridge, and he is survived by his wife and two sons and three daughters. Mr. William Bottomley's genial disposition made him a favourite with all those with whom he came in contact.

Mr. C. D. Phillips.—We regret to announce the death of Mr. C. D. Phillips, of Emlyn Engineering Works, Newport, Mon., which occurred on 21st inst., at the age of 67 years.

Last Friday an unknown visitor died suddenly at the Palatine Hotel, Blackpool, and on Wednesday the body was identified as that of Arthur Stewart Laing, 42, an electrician, who has been travelling the country for the past 12 months in the pursuit of his duties. A verdict of "Death from natural causes" was returned.

NEW COMPANIES REGISTERED.

Commercial Cable Co., Ltd. (124,712).—This company was registered on October 11th, with a capital of £2,000 in £5 shares, to take over the whole or any part of so much of the undertaking of the Commercial Cable Co. (incorporated under Laws of State of New York, U.S.A., in December, 1883, and now carrying on business in the United Kingdom), as is situate or is carried on within the United Kingdom or other part of Europe, or in any Colony or Dependency of the United Kingdom, to generally acquire and assume, wholly or in part, any of the undertaking, property, business, rights, assets and liabilities of the said company or of any other company or association having among its objects the carrying on the business of a telegraph, telephone or cable company, to construct, establish, lay, maintain, repair, renew, and work submarine cables, and land, wireless or other telegraphs or telephones between and in Great Britain and Ireland and any other part of Europe and any Colony or Dependency of the United Kingdom, and America (North and South), and between and in any places or points forming or intended to form part or parts of any kind of telegraphic or telephonic communication or submarine cable route in or between those places or any intermediate places or in any part of the world, to manufacture, for use or sale, and deal in submarine or other telegraph cables, wires and wireless telegraph installations, instruments and other apparatus, to enter into and carry into effect working, traffic or other agreements with Governments, Government Departments, railway, postal, steamboat, telegraph and other companies and authorities, &c. The subscribers (with one share each) are:—Geo. G. Ward, 253, Broadway, New York City, U.S.A., vice-president of the Commercial Cable Co., New York; F. Ward, 63-4, Gracechurch Street, E.C., manager in England of the Commercial Cable Co., New York. Private company. The number of directors is not to be less than five or more than 15; the first are C. H. Mackay, G. G. Ward, E. C. Platt, G. Capperton, and F. Ward; no qualification necessary. Registered by Budd, Johnson & Jecks, 24, Austin Friars, E.C.

G. W. T. T. Syndicate, Ltd. (124,618).—Registered October 5th, with capital £600 in 1s. shares, to carry on the business of a general and wireless telegraph and telephone and electric light, heat and power supply company, &c. The subscribers (with one share each) are:—C. C. Macklin, Guildhall Annexe, 23, King Street, E.C., solicitor; G. Van Zwanenberg Phillips, Guildhall Annexe, 23, King Street, E.C., solicitor. Private company. The number of directors is not to be less than three or more than five; the first are G. Van Zwanenberg Phillips, C. C. Macklin and F. W. Baker; qualification, 20 shares; remuneration as fixed by the company; secretary, B. Simons. Registered office, Guildall Annexe, 23, King Street, E.C.

Joint Standard Union, Ltd. (124,724).—This company was registered on October 11th, with a capital of £3,000 in £1 shares, to acquire inventions relating to joints for pipes, tubes, wires, cables, tubular fittings and the like, and to adopt an agreement with A. G. France. The subscribers (with one share each) are:—H. S. Parlett, 7, Aubrey Road, Hornsey, N., law stationer; T. Dawson, Lennox House, Norfolk Street, W.C. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Registered by Kenneth Brown & Co., Lennox House, Norfolk Street, W.C.

Northern Wireless Schools, Ltd. (124,753).—This company was registered on October 12th, with a capital of £500 in £1 shares, to carry on the business of instructors of wireless telegraphy, manufacturers of and dealers in wireless telegraph, apparatus and accessories, &c. The subscribers (with one share each) are:—Norman Rostron, Heath Howes, Ainsdale, motor expert; J. McKeever, Dower House, Euxton, near Chorley, secretary. Private company. Norman Rostron is the first director. Secretary, J. McKeever. Registered by Alfred H. Atkins, Ltd., 27-8, Fetter Lane, E.C.

Hydro-Electric Concessions, Ltd. (124,748).—This company was registered on October 12th, with a capital of £21,000, in 20,000 7 per cent. cumulative preference shares of £1 each, and 20,000 ordinary shares of 1s. each, to seek and secure openings for the employment of capital in any part of the world, especially in connection with hydro-electric propositions, undertakings and works, to enter into any arrangements with any governments or authorities to work, develop and control hydraulic, electric or hydro-electric works or stations for generating power, &c. The subscribers (with one share each) are:—E. Hammond, 16, Alexandra Park Road, Muswell Hill, N., accountant; G. Solhurst, Clevedon, High Road, Lee, S.E., gentleman; H. F. Wesson, 541, Salisbury House, E.C., incorporated accountant; H. A. Back, 28, Pall Mall, S.W., solicitor; F. Birch, 94, Salusbury Road, Brondesbury Park, N.W., solicitor; J. T. Arnold, 3, Montolieu Gardens, Putney, S.W., clerk; G. L. Devisse, 17, Pembroke Street, N., clerk. Minimum cash subscription, seven shares. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first; qualification, £100. Registered by Surtees, Phillpotts & Co., 6, St. Helen's Place, E.C.

Sevenoaks and District Electricity Co., Ltd. (124,811).—This company was registered on October 16th, with a capital of £40,000 in £1 shares, to carry on the business of producers and suppliers of electricity or electrical currents and force, to acquire from the Urban District Council of Sevenoaks the transfer of, and all benefit and rights under, the Sevenoaks Electric Lighting Order, 1911. The subscribers (with one share each) are:—C. E. Currie, St. Helens, Nursery Road, Sunbury-on-Thames, solicitor; J. A. Russell, 30, Moorgate Street, E.C., accountant; W. E. Baldwin, 12, Carter Street, S.E., clerk; G. F. Wallace, 10, Eastcheap, E.C., mining agent; P. Connolly, 37, Wallbrook, E.C., financier; F. Robinson, Royal Oak Hotel, Sevenoaks, hotel proprietor; R. F. Holland, Lime Tree Hotel, Sevenoaks, hotel proprietor. Minimum cash subscription, seven shares. The number of directors is not to be less than three or more than six: the first are F. Swanzy, J.P., Major H. Fulton and H. W. Handcock; qualification, £500 shares; remuneration, £100 each per annum (chairman, £150), and 5 per cent. of the net profits after 7 per cent. dividend is paid, divisible. Registered by R. Brooks, 24, Lawrence Lane, Cheapside, E.C.

Fallot Incandescent Light Co., Ltd. (124,715).—This company was registered on October 11th, with a capital of £5,000 in £1 shares, to acquire, deal with and turn to account certain inventions or processes relating to the use of gas or electricity, either separately or in combination, for lighting, heating, or otherwise, and to adopt an agreement with W. S. Searle and L. Girodo. The subscribers (with one share each) are:—W. S. Searle, 27, Noel Street, W., merchant; W. H. Lowe, 35, Mowbray Road, Brondesbury, N.W., engineer. Private company. The number of directors is not to be less than two or more than five; the first are W. S. Searle and W. H. Lowe; qualification, £100; remuneration, £150 each per annum (chairman £175). Registered office, 27, Noel Street, Wardour Street, W.

Brabbins Fuelless Engine Syndicate, Ltd. (124,686).—This company was registered on October 10th, with a capital of £500 in £1 shares, to carry on the business of engineers, cycle and motor manufacturers, electricians, &c. The subscribers (with one share each) are:—A. G. Jeffs, 6, Cranford Street, Wolverhampton, merchant; B. Brabbins, Rosedale, Calf Heath, Shareshill, near Wolverhampton, engineer; W. Sammons, 41, Victor Street, Walsall, gentleman; A. E. Edwards, Bushbury, Wolverhampton, baker and grocer. Private company. The number of directors is not to be less than two or more than seven; the first are A. G. Jeffs, B. Brabbins, W. Sammons and A. E. Edwards. Solicitor, J. Ore, Old Square, Birmingham. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

Ennig Electric Light and Power Co., Ltd. (124,822).—This company was registered on October 17th, with a capital of £1,000 in £1 shares, to carry on the business indicated by the title, and to adopt agreements with G. J. Lewis and Elizabeth M. George. The subscribers are:—W. F. Burton, Pontvaen, Hay, *via* Hereford, electrical engineer, 50 shares; H. Williams, J.P., The Cottage, Talgarth, medical practitioner, 10 shares; J. Parry, Phœnix House, Talgarth, chemist, 25 shares; W. Jones, Pendre, Talgarth, farmer, 25 shares; W. V. Pugh, Radnor Arms, Talgarth, licensed victualler, 25 shares; T. B. Walker, Masons Arms, Talgarth, licensed victualler, 10 shares; H. Rouse Armstrong, Hay, solicitor, 1 share. Minimum cash subscription, 250 shares. The first directors are W. F. Burton, H. Williams, J.P., J. Parry, W. Jones, W. V. Pugh and T. B. Walker. Secretary, J. Parry; solicitors, Cheese and Armstrong, Hay, *via* Hereford. Registered office, 11, St. Mary's Place, Hay, *via* Hereford.

Metal Plates, Ltd. (124,852).—This company was registered on October 18th, with a capital of £6,000 in £1 shares (3,000 "A" and 3,000 "B"), to carry on the business of smelters, refiners, rollers, assayers and manufacturers of and dealers in minerals, metals, ores, precious stones and metallurgical and mineral substances of all kinds, electricians, electrical engineers, &c., and to adopt an agreement with S. O. Cowper-Coles. The subscribers (with one "A" share each) are:—S. O. Cowper-Coles, 1 and 2, Old Pye Street, Westminster, electro-metallurgist; W. Craddock, 1 and 2, Old Pye Street, Westminster, secretary. Private company. The number of directors is not to be less than three or more than six; the first are Colonel J. R. Wright, J. G. Gordon and S. O. Cowper-Coles. The last-named has the right to nominate two directors; qualification, 100 shares; remuneration as fixed by the company. Registered office, 1 and 2, Old Pye Street, Westminster.

Mickelwright, Ltd. (124,832).—This company was registered on October 17th, with a capital of £1,000 in £1 shares, to take over the business of electrical engineers, manufacturers of and dealers in electrical apparatus carried on at Sicilian House, Southampton Row, W.C., and to adopt an agreement with W. R. Mickelwright. The subscribers (with one share each) are:—W. R. Mickelwright, 5, Brandenbury Road, Gunnersbury, W., electrical engineer; W. W. Peck, 63, Meadvale Road, Brentham, Ealing, W., chemical engineer. Private company. The number of directors is not to be less than two or more than three; the first are W. R. Mickelwright and W. W. Peck. Registered by W. A. Warren, 25, Ironmonger Lane, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Stearn Electric Lamp Co., Ltd. (95,340).—Return dated July 23rd, 1912 (filed July 24th). Capital £4,070 in £10 shares; 407 shares taken up; £10 per share called up on seven; £70 paid; £4,000 considered as paid on 400 shares. Mortgages and charges: Nil.

United River Plate Telephone Co., Ltd. (23,654).—Return dated August 6th, 1912. Original capital £500,000 in £5 shares. Present capital £2,000,000 in £5 shares (230,000 ord., 40,000 pref. and 180,000 unissued); 230,000 ord. and 40,000 pref. taken up; £5 per share called up on 214,000 ord. and 40,000 pref.; £1,270,000 paid; £80,000 considered as paid on 16,000 ord. Mortgages and charges: £500,000.

Tubes, Ltd. (91,224).—Return dated July 25th, 1912 (filed September 20th). Capital £100,000 in £1 shares; all shares taken up; £82,859 paid; £17,141 considered as paid. Mortgages and charges: £39,500.

United Electric Tramways of Monte Video, Ltd. (80,456).—Return filed July 23rd, 1912. Capital £1,000,000 in £5 shares (100,000 pref. and 100,000 ord.); 90,000 pref. and 80,000 ord. taken up; £5 per share called up on 16,221 pref. and 12,800 ord.; £145,105 paid; £704,895 considered as paid on 75,779 pref. and 67,200 ord. Mortgages and charges: £880,000.

Buenos Ayres City and Suburban Tramways, Ltd. (114,031).—Agreement for further advances and holding over requirement of issue of bonds, dated September 4th, 1912, to secure not more than £20,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. Holders: Buenos Ayres Port and City Tramways, Ltd., 2, Broad Street Place, E.C.

South American Cable Co., Ltd.—Return dated August 6th, 1912. Capital £500,000 in £10 shares; 24,707 shares taken up; £147,070 paid; £100,000 considered as paid. Mortgages and charges: Nil.

British and Continental Electricity Co., Ltd. (57,088).—Return dated September 13th, 1912. Capital £40,000 in £1 shares (10,000 pref.); 1,000 pref. and 997 ord. shares taken up; £16,370 paid on 790 pref. and 847 ord.; £3,600 considered as paid on 210 pref. and 150 ord. Mortgages and charges: Nil.

Pontelec Welding Patents, Ltd.—Issue on September 27th, 1912, of £300 debentures, part of a series of which particulars have already been filed.

G. H. Cox & Co., Ltd.—Issue on September 10th of £1,000, and on September 11th, 1912, of £500 debentures, parts of a series of which particulars have already been filed.

South London Electric Supply Corporation, Ltd.—Issue on July 1st of £10,000, and on July 30th, 1912, of £50 debentures, parts of a series of which particulars have already been filed.

North Wales Power and Traction Co., Ltd. (78,193).—Particulars of £7,000 "B" debentures, created January 31st, 1912, filed pursuant to Section 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital, subject to certain prior charges but ranking in priority to second mortgage debentures. No trustees.

"Z" Electric Lamp Manufacturing Co., Ltd. (96,594).—Memorandum dated September 20th, 1912, endorsed on £25,000 debentures, increasing rate of interest from 6 per cent. to 8 per cent.

Creed, Bille & Co., Ltd.—Two debentures, dated October 3rd, 1912, to secure £1,175 and £2,350 respectively, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: W. A. Coulson, 156, St. Vincent Street, Glasgow, and F. G. Creed, 266, Selsdon Road, Croydon.

Mann, Egerton & Co., Ltd.—Debenture, charged on company's undertaking and property, present and future, including any issued or uncalled capital (but not unissued capital, or calls already in arrears), dated October 3rd, 1912, to secure all moneys due, or to become due, from the company to Barclay and Co., Ltd., 54, Lombard Street, E.C., not exceeding £10,000.

Brush Electrical Engineering Co., Ltd.—Issue on September 29th, 1912, of £20,000 debentures, part of a series of which particulars have already been filed.

Hong Kong Tramway Co., Ltd.—A memorandum of satisfaction, to the extent of £2,000, on September 3rd, 1912, of trust-deed dated July 1st, 1903, securing £195,000, has been filed.

Edmundson's Electricity Corporation, Ltd.—Return dated August 8th (filed September 14th), 1912. Capital £800,000, in 80,000 ordinary and 80,000 preference shares of £5 each. All shares taken up. £734,000 paid on 66,800 ordinary and 80,000 preference. £ 6,000 considered as paid on 18,200 ordinary. Mortgages and charges: £472,000.

Clarke, Steavenson & Co., Ltd. (57,821).—Return dated September 5th, 1912. Capital, £3,000 in £1 shares. All shares taken up. £1 per share called up on 1,400, and 15s. per share on 1,603. £2,600 paid. Mortgages and charges: £300.

General Accessories Co., Ltd. (104,464).—Return dated August 5th, 1912. Capital £3,000 in 1,580 6 per cent. pref., 920 5 per cent. pref., and 500 ord. shares, all of £1 each; 1,552 pref. (class of pref. not stated) and 500 ord. shares taken up; £632 paid; £1,420 considered as paid. Mortgages and charges: Nil.

Blackburn, Starling & Co., Ltd. (61,302).—Return dated August 1st (filed August 17th), 1912. Capital £12,000 in £1 shares; 11,168 shares taken up; £7,268 paid; £3,900 considered as paid. Mortgages on freehold property and workshops: £4,600.

Ackroyd & Best, Ltd. (54,600).—Return dated August 22nd, 1912. Capital £25,000 in 8,200 pref. and 1,800 def. shares of £5 each: all shares taken up; £5 per share called up on 3,100 pref.; £15,500 paid; £9,500 considered as paid on 100 pref. and 1,800 def. Mortgages and charges: £55,850 sealed debs.; £7,550 floating debs. sealed to cover overdraft at bank and guarantors.

Halifax and Bermudas Cable Co., Ltd. (28,972).—Return dated September 19th, 1912. Capital £50,000 in £5 shares; all shares taken up; £50,000 considered as paid. Mortgages and charges: Nil.

CITY NOTES.

Uxbridge and District Electric Supply Co., Ltd.

THE directors report that the accounts for the year ended December 31st, 1911, show a gross profit of £4,355, out of which interest on debenture stock absorbs £3,287, leaving £1,068, plus £751 brought forward, making £1,819 available. Out of this there is to be placed to bad debts reserve £255, to write off from preliminary expenses and discount on debentures £793, to write off advance to wiring department £76, carrying forward £695. The troubles through which the company has passed during the preceding two years can now be looked upon as ended, and the directors have every confidence in the future success of the undertaking. The business continues to grow in a satisfactory manner, and applications for lighting and power are coming in daily at prices which are satisfactory, and which it is anticipated will produce a considerable addition to the balance at the credit of profit and loss when this year's accounts come to be made up. The total output for 1911 was 815,995 units. In the balance-sheet several items still remain from the old accounts. These are having the attention of the directors, who will deal with them in due course. Since the end of last year, the directors have been successful in placing £15,000 of the 6 per cent. cumulative preference shares, and they are negotiating at the present moment for the placing of the remaining £10,000, which will be required in the immediate future for remunerative extensions. It is the intention of the board during the current year to commence the supply of electricity in the Beaconsfield area, and to duplicate and extend the existing mains and network in Gerrard's Cross.

At the twelfth ordinary general meeting held on Thursday last week at Hamilton House, Victoria Embankment, MR. CHAS. H. MCEUEN, in moving the adoption of the above report, said that the gross profit for the year under review had amounted to £4,354, and that the troubles through which the company had passed during the past two years could now be looked upon as ended, and the directors had every confidence in the future success of the undertaking.

MR. T. PETERSEN seconded the motion, and the report was adopted.

Drake & Gorham, Ltd.

AT the annual meeting held on the 16th inst., MR. B. M. DRAKE (the chairman), in moving the adoption of the report (see ELECTRICAL REVIEW, p. 589), said that the profit of £9,021 for the year was £1,537 better than for 1911, which showed an increase of £1,427 on 1910. They were adopting a conservative policy in proposing to keep the dividend the same as last year, for their available working capital was none too large for the important developments that they had in hand. Experience showed them that their policy of employing the best engineers and workmen was sound, for with work going on in every part of the country, it was essential that managers, foremen, and men, should all be equally interested in securing the good name of the firm. Colonel Holden, late R.A., F.R.S., M.I.E.E., &c., had consented to give the firm the benefit of his long experience as superintendent of the Arsenal in connection with certain new developments which the company had in hand. The chairman proceeded to give a lengthy list of the names of some of the year's *clientèle*. The impetus given to electric lighting by the introduction of the metal lamp still continued, for not only were they enabled to bring electricity within the means of many who could not formerly have afforded the luxury, but it had also decreased the bills for energy from supply stations to such an extent that it was now actually cheaper than gas. The policy of conducting their wholesale business as an entirely separate organisation had been justified. The turnover had considerably increased, and a still further improvement was apparent on the few months of this year's trading. All trade orders were now received at 1, Felix Street, Westminster Bridge Road, which was adjacent to their stores, and this had facilitated the handling of goods and resulted in improved delivery. The business of the Metallic-Filament Lamp Co. trading in Liverpool had been acquired during the year, the consideration for goodwill being met out of part profits, so that for a time the benefit of this business would not be apparent in the balance-sheet, but the results so far had fulfilled expectations. Their manufacturing profits had increased considerably, and the factory was at present busy. The use of electricity as a means of transmitting power was rapidly extending, and during the year they had done work of this class for the Droylesden Foundry Co., Ltd., T. Littlewood & Sons, Ltd., Porritt Bros. & Austin, Deakins, Ltd., Black & Brownlow, and others. Trade had been particularly brisk in the North, and the Manchester branch was to be congratulated on the greatly improved results. Judging by the numerous inquiries received, he had every hope that if the present wave of good trade continued, and the political horizon cleared, their progress might continue.

The report was adopted, and the dividend declaration of 4½ per cent. on the ordinary shares was approved.

Auckland Electric Tramways Co., Ltd.

THE annual meeting was held on Monday at the Electrical Federation Offices, Kingsway, W.C., Mr. C. G. Tegetmeier presiding.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 630), once again congratulated the shareholders upon the results of a successful year's working. The progressive expansion in their business which they had experienced in every successive year of the company's operations since they started electrical running in 1902 had been continued during the past year, and although there was no increase in the route-mileage worked, the traffic receipts showed an increase of £18,975, and amounted to £229,142, which was nearly £10,000 per route-mile of line. The number of passengers increased from 33 millions to 36 millions. The population of Auckland served by the tramways was about 100,000, so they carried that population 360 times in the course of the year; in other words, they carried daily an average number of passengers equal to the whole of the population, and, of course, on many days they carried a number very largely in excess. The working expenses showed a considerable increase, the larger portion of which was in the item of power and running expenses, which amounted to £85,607, or £12,509 more than in the previous year. A considerable portion of this increase was the natural result of the largely increased car-mileage, and another portion was due to the large increase in wages to the men. The expenditure on repairs and maintenance—£34,187—was £6,040 less than in the previous year, but, in addition, they spent upon the important item of renewals £7,570, which was charged to the renewals and depreciation account. The expenditure upon renewals, more particularly upon renewals and reconstruction of the permanent way, was likely to be an increasing amount for some years to come, and during the next few years they would probably make very considerable inroads upon the renewals and depreciation fund. The necessity of making provision for expenditure of this nature could not be questioned. Out of last year's revenue they had set aside £20,000 to the renewals account, which was the same amount as in the previous year. The account would then amount to £71,007, or a net increase of £12,429 during the year, and they believed they were providing adequately for the future in that respect. Debenture and other interests had absorbed £17,321, and the rental and percentage of profits payable to the Auckland City Council required £5,258. Since the last meeting he had paid a visit to Auckland, and had had the advantage of discussing with the local directors and the management many matters of importance in connection with the company's business. It was three years since he had been in Auckland previously, and he was much struck with the developments that had taken place, and the progress that had been made in the interval. The most noticeable feature was the growth of the suburban districts, which, owing to rapid and efficient tramway communication, were becoming more and more the residential area of the city. The crush of people and tramcars at their city terminus at five o'clock, and for some time after, every day, compared in intensity with the most crowded centres of London, and in Auckland, as well as in London, the difficult question of providing tramway facilities for large bodies of people wanting to leave the same spot at the same time had to be dealt with. The matter had the most serious consideration of the management, and also of the Auckland City

Council, whose co-operation they most gladly welcomed. In every direction Auckland had made exceptional progress during recent years, and the present evidences of prosperity were very marked. The expenditure of a community upon tramway travelling might be regarded as a fairly reliable barometer as to its prosperity, and if they adopted that test they might be well satisfied to note that their traffic receipts equalled considerably over £2 per head of the whole population per annum, as compared with the 10s. per head, which would be regarded as a fairly satisfactory figure in a prosperous community in this country. He saw no reason to doubt that this progress would be continued in the future. The one thing needed, and that might be said of New Zealand generally, was a more rapid increase in the population. An important matter that came up for settlement during his visit to Auckland was the revision of the terms and conditions of employment in the company's service; a matter which had been discussed by the board before he left this country. The labour legislation of New Zealand provided machinery by means of a Conciliation and Arbitration Act for dealing with industrial disputes and for settling the relations between employer and employed, but it had this somewhat extraordinary feature—that it permitted any industrial union by cancelling its registration under the Act to free itself from its operations and from the jurisdiction of the Arbitration Court. The Auckland Tramways Industrial Union adopted that course, and previous to his arrival in the city had formulated rather extravagant demands for increased wages and improved conditions of service, and the question had to be settled between the company and the Union direct. The company had always been desirous of meeting its employés in a fair and equitable manner, and they were prepared to go to the fullest extent, which they considered reasonable and practicable. At one time a strike seemed imminent, but he was glad to say that after many conversations and discussions their proposals were accepted and an agreement was arrived at which represented a very material increase in the scale of wages, besides providing concessions in other directions. The agreement involved an increase in their wages bill of not less than £12,000 a year, which was, he thought, a very liberal sharing with labour of the profits of the company. It came into force at the beginning of the year, so that the present accounts only showed the effect of the increased expenses for six months. Under the new scale their motor men, after three years' service, got 1s. 2½d. per hour, and conductors 1s. 1d. per hour, which was probably double what men in similar positions received in this country. All time worked over 8½ hours in any one day was paid for at time and a half rates, and they guaranteed all traffic men a minimum of eight hours' wage per day. They were able to pay those high wages, because of the high scale that prevailed in all industries in New Zealand, and the correspondingly high purchasing powers of the people gave them their high traffic receipts. During his two months' stay in Auckland, he had opportunities of meeting the Mayor and members of the City Council and other local bodies, and he was glad to say that their relations with them continued cordial and harmonious. The history of the company had been one of continuous expansion and continuous capital expenditure. Ten years ago they started with 43 cars and 900 KW. of plant, which at that time was considered an extravagant scale for remunerative employment, with the result that the promoters of the company were left to carry the whole of the financial burden of the undertaking. In successive years as requirements had increased, large sums had been spent in providing increased facilities, and to-day they had 136 cars and generating plant of 4,900-KW. capacity. Their capital expenditure last year amounted to £85,351, of which £38,000 was spent on cars, £21,000 upon power station plant and machinery, £7,000 upon developments of the permanent way, £12,000 upon a new car-shed, and the remainder upon various capital purposes. They had also spent £5,567 on the purchase of the freehold of their power station site, which under their lease they had the option of buying at a price which was very much less than its present market value. Their stores and materials on hand were £11,000 more than on June 30th, 1911, their sundry debtors were £7,500 more, and cash was £16,000 more. To provide the necessary funds for that expenditure, they issued during the year £50,000 of preference shares, and £50,000 of debenture-stock, and for some time past they had been using their reserve funds for the purpose of capital outlay, instead of issuing fresh capital. The capital outlay of the company was very largely in excess of the share and debenture capital. They had considerable further capital expenditure in view, and to meet the needs of developing suburbs, they had agreed to construct several short extensions, and were increasing their rolling stock by 25 more cars, all of which they hoped to have available before this time next year. That would make a total of 161 cars, or an addition of 61 cars, costing about £70,000 in two years. That large increase necessitated the provision of still further car-shed accommodation, and also an extension of their car repair works and equipment, and altogether a good deal of expenditure would have to be incurred. They proposed to make an issue of £50,000 in preference shares, and although their preference shares at the present time were at a considerable premium, they proposed to give shareholders the full benefit of the shares, and to adopt the same course as on the last occasion by offering the new shares *pro rata*, to existing ordinary and preference shareholders at par. The issue of those shares would enable them to issue another £100,000 of debenture stock when the need arose, which would place them in a very strong position with regard to further capital requirements. In conclusion, the chairman said that the company was well served on the spot by an excellent staff, and he saw every reason to anticipate continued prosperity

Mr. C. Shirreff Hilton seconded the motion.

Mr. Leo Myers, as one who had recently returned from Auckland, endorsed the remarks of the chairman as to the present prosperity and future possibilities of the city, and expressed his confident opinion in the future of the company under its present able management both in London and New Zealand.

The Chairman, in reply to a shareholder, said that the agreement with the men's union was for one year, and it was to remain in force thereafter until one side or the other gave notice to terminate it.

The report was adopted.

Subsequently, at an extraordinary meeting, a resolution was unanimously passed increasing the capital from £450,000 to £500,000 by the creation of 50,000 new preference shares of £1 each, ranking, *pari passu*, with the existing preference shares.

Ottawa Electric Co.—This company has resolved to increase its capital from $2,000,000 to $5,000,000. Large extensions and improvements are contemplated. The president of the company is Mr. Thomas Ahearn, Ottawa.

Continental.—Belgium.—La Société de la Manufacture de Cables, Accumulateurs et Appareils Electriques, of Seneffe, is declaring a dividend of 3 per cent. for the last financial year.

Kaministiquia Power Co.—The directors announce a dividend at the rate of 4 per cent. per annum, for the quarter ending October 31st.

Montreal Light, Heat and Power Co.—The directors have declared a dividend of 2¼ per cent. on the paid-up capital stock, being at the rate of 9 per cent. per annum, for the quarter ended October 31st.

Clyde Valley Electrical Power Co.—Mr. F. C. Gardiner, who presided at the half-yearly meeting of this company in Glasgow, moved the adoption of the report, and said that the adverse effect of the coal strike on the company's output and revenue had not been so great as might have been expected, that the company continued to show substantial progress, and that there was a steady demand on the part of manufacturers of all classes for the company's supply. The contracts for supply showed an increase of 4,000 H.P. during the half-year. The prov. order authorising the company to issue cumulative preference shares and for other purposes had been passed, and the confirming Act has received the Royal Assent. The report and accounts were adopted. Resolutions were passed authorising an issue of preference shares and the creation of a special reserve fund.

STOCKS AND SHARES.

Tuesday Evening.

Of the panicky feeling which demoralised markets about ten days ago there has been no recurrence, but it cannot be said that the Stock Exchange is at all happy. The aftermath of the slump is to be seen in severe liquidation, though of a quiet kind, and confidence continues very coy about returning to the Stock Exchange markets. The chief seat of the uneasiness is in Paris, while some of the Belgian operators are known to have been speculating beyond their means. The only effect, however, upon the markets with which we are concerned is to bring about a little depression in the prices of Latin-Canadian issues, to which the state of affairs in Mexico adds emphasis.

The principal feature in the Home Railway markets, so far as the price movements are concerned, is a jump of 12s. 6d. in Great Northern and City Railway Preferred Ordinary, the shares to which reference has been made here a good many times as worth the attention of the long-sighted capitalist prepared to take up his interest and wait for developments in the future. Rumour is busy with the idea that the Great Northern and City may be linked up with the other tubes, while it is also said that the Great Northern Railway is at last going to endeavour to get control. This latter was the basis upon which many of the original subscribers founded their applications for shares, but it was destined to be rudely upset almost from the start. Its revival may be due in some measure to the expectation—or hope—that the Midland intends to obtain a controlling interest in the City and South London, though this particular anticipation is a little damped this week by a fall of 2 in the price of City and South London Ordinary stock.

On the other hand, Central London Ordinary and Deferred have each regained a small part of their last week's falls, though the Preferred at 84 is a point down. It is worth remembering, in connection with Home Railways, that the second half-year is that in which the "fat" dividends are paid upon most of the stocks. Central London Deferred, for example, carries the full year's distribution in its price up to the end of the twelvemonth. Metropolitans, after touching 56, came back to 54, and Districts rose to nearly 40 before they reverted to 38¼.

London United Tramways Preference shares recovered the 10s. which they shed last week, but there is no particular change in Metropolitan Electric Tramways issues. British Electric Traction 5 per cent. Debenture stock fell away 3¼, and the 6 per cent. Preferred is ¼ down at 12¼.

In the English Electric Lighting market the changes are fairly well distributed between rises and falls. While there are advances in Brompton Preference, Charing Cross Preference, and St. James's Ordinary, there are small falls in Bournemouth and Poole Ordinary and Second Preference, County of London Ordinary, and Westminster Preference. A rise of £1 in City of London Ordinary restores the quotation to its level of last week, and there has been a disposition to buy the shares speculatively again. The market, as a whole, is very quiet, and the recent little buying movement has been somewhat checked by the consideration that the final dividends for the year are certainly not likely to be improved by the incidence of the Insurance Act, and the increased cost of fuel, &c., due to the labour troubles this year.

Mexico has the ever-present thorn of revolution to trouble the country's securities once more this week. The rebels have certainly done their work well up to now, and few people on this side will be astonished if they succeed in planting General Felix Diaz in the Presidency and turning out the present occupant of the office, President Madero. If this can be accomplished without much bloodshed, the general Stock Exchange opinion seems to be that it will be a step in the direction of something like a real settlement of Mexican affairs upon a more permanent basis than has been enjoyed for the last half decade or so.

Mexican Light and Power, after its 6 points fall, is another 1½ down, and Mexican Electric Lighting bonds and Vera Cruz bonds are lower by a point each. Mexican Tramway Common shares shed 2½, and the 5 per cent. bonds lost 1. There is no movement in Monterey Debentures. Montreal Light, Heat and Power recovered half of its 12 points fall, and Shawinigan Water rallied to the extent of 3, while Canadian General Electrics are 1 to the good. Calcutta Electric Supply Ordinary are ½ down; the interim dividend at the rate of 7 per cent. per annum has just been announced. Calcutta Trams are also easier, falling ⅛ to 6¼. Rio Trams have regained 9, and Sao Paulo Trams 7, of their previous big falls, and the First Mortgage Bonds rallied ½. Anglo-Argentine 4 per cent. Debentures eased off ½. The amount which the underwriters of the recent new 5 per cent. Debenture issue had to take up came to about 80 per cent. The company's first Preference shares, however, recovered $\frac{1}{16}$. British Columbia Electric stocks are firmer. Part of the many falls last week were due, of course, to the expectation—or to the anticipation, rather—of sellers coming along to realise investments in order to raise money required to pay differences; but not much real stock came out, and upon the appearance of bargain-hunters, quotations were quickly readjusted to a level approaching that which prevailed before the slump.

The Telegraph market has been undergoing violent excitement in connection with Marconis. After falling to 4¾, the price jumped to 5⅛ with scarcely a break, reverting later on to $5\frac{1}{16}$, leaving a rise of $\frac{3}{16}$ on the week. The Preference moved in sympathy. All the friends of the celebrated inventor are thankful that he has escaped from his motor accident with the loss of one eye only, much as they have regretted that there should have been this result. At first, it was greatly feared that Mr. Marconi might lose his sight altogether. The somewhat grim jest in the Stock Exchange is that the name of the great scientist ought now to be spelt without the final letter, having regard to the result of his operation.

National Telephone Deferred is again a point lower, and West India and Panama Telegraphs rallied $\frac{3}{16}$, to lose it later. Movements in all speculative stocks and shares are extremely erratic, and, as the Stock Exchange says, markets cannot be trusted very far, in view of the unsettled conditions of financial affairs, more especially on the Continental Bourses. Indo-European Telegraphs rose ½, but Great Northerns have not yet recovered from their weakness. Direct United States eased off to 7½; the Anglo-American group as a whole is a little lower. Amazon Telegraphs are ⅛ up, while Globes moved down to 11 middle.

There are several changes of consequence amongst Manufacturing shares. Edison & Swan partly-paid shares have been marked down $\frac{1}{16}$—shares changed hands at 5s. 3d. the other day—and the fully-paid were put down ¼. These falls may possibly be the outcome of the suggestion to reorganise the capital, of which mention was made here last week. Brush 4½ per cent. Debenture dropped 3, from which it might appear that the attempt to place the new 6 per cent. participating Debenture, by the process of allotment, were not a great success so far. Castner-Kellners and Dick, Kerrs are both $\frac{1}{16}$ better, while India-Rubber shares have begun to go back again. Babcock & Wilcox lost their previous improvement, though British Aluminium Debenture continues to creep up. The Rubber Share Market is dull and depressed, the dwindling in the price of the raw stuff causing a certain amount of exasperation to rubber shareholders whose guides and counsellers had been promising them that the day of improvement in the produce was near at hand.

Metallic Seamless Tube Co., Ltd.—According to the *Financier*, the report states that the net profits for the past year were £3,580, plus £5,034 brought forward. A dividend of 10 per cent. is proposed, adding £5,000 to the reserve, and carrying forward £1,740.

Calcutta Electric Supply Corporation, Ltd.—The directors have declared an interim dividend, at the rate of 7 per cent. per annum, on the ordinary shares for the six months ended June 30th last, payable on November 15th.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, October 23rd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	per lb.	2¾d.	..
a „ Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16 10	..
a Copper Sulphate	„	£26	..
a Lead, Nitrate	„	£26 10	..
a „ White Sugar	„	£25 10	..
a „ Peroxide	„	£39	..
e Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3¾d.	..
a Potash, Caustic (88/90 %)	per ton	£22 10	..
a „ Chlorate	per lb.	3¾d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	„	7½d.	..
a Shellac	per cwt.	70/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70/72 %)	„	£10 5	..
a „ Chlorate	per lb.	3¾d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£85	£3 inc.
b „ Wire, in ton lots	„	£112	£10 inc.
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	9¼d.	..
c „ Tube (brazed)	„	11¼d.	¼d. dec.
c „ „ (solid drawn)	„	9¾d.	¼d. dec.
c „ Wire, basis	„	9¾d.	..
c Copper Tubes (brazed)	„	1/0¾d.	¼d. dec.
c „ „ (solid drawn)	„	11¼d.	¼d. dec.
g „ Bars (best selected)	per ton	£91	£4 dec.
g „ Sheet	„	£91	£4 dec.
g „ Rod	„	£91	£4 dec.
d „ (Electrolytic) Bars	„	£82	10s. dec.
d „ „ Sheets	„	£99	£1 10s. dec.
d „ „ Rods	„	£87	£2 dec.
d „ „ H.C. Wire	per lb.	10⅞d.	1/16d. inc.
f Ebonite Rod	„	5/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/10	..
h Gutta-percha, fine	„	..	..
h India-rubber, Para fine	„	4/6½	¾d. dec.
j Iron Pig (Cleveland warrants)	per ton	66/3	6d. dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£19 12 6	£2 5s. dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8	..
e Mica (in original cases) small	per lb.	6d. to 8s.	..
e „ „ „ medium	„	3/6 to 6/-	..
e „ „ „ large	„	7/6 to 11/-	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	11¼d.	¼d. inc.
Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£231 to £233	inc.
n „ Wire, Nos. 1 to 16	per lb.	2/7	..
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh's (Vieille Montagne bnd.)	„	£31 12 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Ferranti, Ltd.—The annual meeting of this company was held yesterday, Thursday. Our report will appear next week.

Monte Video Telephone Co., Ltd.—Our report of this company's meeting, which was held on Wednesday, will appear next week.

West India and Panama Telegraph Co., Ltd.—The directors announce a dividend of 1s. 6d. per share on the ordinary shares.

Cuba Submarine Telegraph Co., Ltd.—The directors have declared a dividend at the rate of 6 per cent. per annum for the half-year ended at June last.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Oct. 22nd.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord.	10	5½	5†	9¼ — 10¼	— ¼	5 4 9
Do. 4½ % Pref.	10	4½	4½	8½ — 9½	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10 — 10½	— ¼	5 14 8
Do. 4½ % Deb. Stock	Stock	4½	4½	98 —100	..	4 10 0
Brompton & Kensington, Ord.	5	10	9†	9 — 9½	..	5 5 3
Do. 7 % Cum. Pref.	5	7	7	8½ — 9	+ ¼	3 17 9
Central Electric Supply, 4 % Guar. Deb.	100	4	4	97 —100	..	4 0 0
Charing Cross, West End & City	5	5	5†	4⅞ — 5⅜	..	4 13 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4½	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4 — 4½	+ ¼	5 0 0
Do. Do. 4 % Deb.	100	4	4	94 — 96	..	4 8 4
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	98 —101	..	4 9 1
City of London, Ord.	10	8	6†	16 — 18	+ 1	4 9 0
Do. 6 % Cum. Pref.	10	6	6	12½ — 14	..	4 5 9
Do. 5 % Deb.	Stock	5	5	118 —122	..	4 2 0
Do. 4½ % Second Deb.	100	4½	4½	99 —102	..	4 8 3
County of London, Ord.	10	6	4†	11¼ — 11⅝	— ¼	5 2 2
Do. 6 % Pref.	10	6	6	11⅝ — 12⅛	..	4 19 0
Do. 4½ % Deb.	Stock	4½	4½	106 —108	..	4 3 4
Do. 4½ % Second Deb.	Stock	4½	4½	100 —103	..	4 8 3
Edmundson's, Ord.	5	Nil	..	1/16 — 1/8	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3/8 — 3/4	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	92 — 95	..	4 14 9
Hove	5	9	8†	7⅞ — 7⅞ xd	..	5 14 3
Kensington & Knightsbridge, Ord	5	9	8†	7½ — 8	..	5 12 6
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	78 — 82	..	5 9 9
London Electric, Ord.	8	2½	..	1⅜ — 2⅛	..	3 10 8
Do. 6 % Pref.	5	6	6	4½ — 5¼	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	90 — 93	..	4 6 0
Metropolitan	5	4	4†	3⅝ — 4⅛	..	4 17 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅝	..	4 17 4
Do. 4½ % First Mort. Deb.	Stock	4½	4½	99 —102	..	4 8 3
Do. 3½ % Mort. Deb.	Stock	3½	3½	86 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	97½ — 99½	..	4 10 6
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98½ —101½ xd	..	4 18 6
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 11	..	5 9 1
Oxford	5	7½	6†	6 — 6½	..	5 11 6
St. James' and Pall Mall, Ord.	5	10	10†	9 — 10	+ ½	5 0 0
Do. 7 % Pref.	5	7	7	6⅞ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 88	..	3 19 7
Smithfield Markets, Ord.	5	2	..	1⅜ — 1⅝	..	..
South London, Ord.	4	5	..	3 — 3½	..	5 14 3
Do. 5 % First Mort. Deb.	100	5	5	98 —101	..	4 19 0
South Metropolitan, 7 % Pref.	1	7	7	1⅜ — 1⅝	..	5 12 0
Do. 4½ % First Deb. Stock	100	4½	4½	96 — 99	..	4 11 0
Urban, Ord.	£3	Nil	..	2/8 — 3/8	..	..
Do. 5 % Cum. Pref.	5	2	‡	2⅜ — 3½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	84½ — 88½	..	5 1 8
Westminster, Ord.	5	10	9†	8⅝ — 9¼	..	5 8 1
Do. 4½ % Cum. Pref.	5	4½	4½	4⅞ — 5¼	— ⅛	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 4 4
Calcutta, Ord.	5	8½	..	7⅜ — 7⅝	— ¼	5 11 6
Do. 5 % Pref.	5	5	5	4 13/16 — 5 3/16	..	4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	93½ — 95½	..	5 4 9
Canadian Gen. El. Com.	$100	7	7	116 —120	+1	5 16 8
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	8	..	½ — 1	..	3 0 0
Do. 5 % Deb.	100	5	5	94 — 97	..	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92 — 94	..	6 7 8
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	83 — 86	..	5 16 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	95⅓ — 97⅓	..	5 2 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/32 — 1/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 1 1/16 xd	..	8 14 6
Kaministiquia Power, 5 % G. Bs.	$500	5	5	104 —106	..	4 14 4
Madras, Ord.	5	Nil	..	1⅛ — 2	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105	..	4 15 3
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	86 — 88	—1	5 13 3
Mexican Lt. & Power, Common	$100	4	4†	85 — 88 xd	—1½	4 11 0
Do. 7 % Cum. Pref.	$100	7	7	103 —106 xd	..	6 12 1
Do. 5 % 1st Mort. Gold Bds.	..	5	5	98¼ — 95⅓	—⅓	5 4 9
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	85 — 88	..	5 13 8
Montreal, Lt., H. and Power	$100	8	9†	238 —243	+6	3 14 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	39 — 42	..	..
River Plate, Ord.	Stock	10	..	240 —250	..	4 0 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	109 —114	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	98 —100	..	4 10 0
Shawinigan Water, Capital	$100	5	5	143 —147	+3	3 8 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	103 —105	— ½	4 5 9
Toronto Power, 4½ % Deb.	Do.	4½	4½	96½ — 98½ xd	— ½	4 11 5
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	93 — 96	—1	5 4 2
Victoria Falls Power, Pref.	1	11½d.	17½d.	1⅝ — 1	+ 1/16	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	..	7⅜ — 7⅞	+ ⅛	5 1 7
Do. 5 % Deb. Red.	Stock	5	5	96 — 98	..	5 2 0
American Telep. & Teleg., Cap.	$100	8	8†	145½ —147½	— ½	5 8 6
Do. Collat. Trust	$1000	4	4	93½ — 95½	..	4 3 9
Anglo-American Telegraph	Stock	8	8	67 — 69 xd	..	4 7 0
Do. 6 % Pref.	Do.	6	6	111 —112 xd	— ½	5 7 2
Do. Def.	Do.	30/-	..	25⅞ — 26	— ¼	5 15 5
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	8	7⅜ — 7⅞	..	4 8 11
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	82 — 84	— ½	4 15 8
Cuba Telegraph	10	6	..	9¼ — 10½	..	5 14 3
Do. 10 % Pref.	10	10	10	16½ — 17½	..	5 14 3
Direct Spanish Telegraph, Ord.	5	4	4†	8⅛ — 8⅜	+ ⅛	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6¾ — 7	..	7 2 10
Direct United States Cable	10	5	4	7⅛ — 7⅜	— ⅛	6 9 0
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	129 —132 xd	..	5 6 1
Do. 8½ % Pref. Stock	Do.	8½	8½	77 — 79 xd	..	4 8 1
Do. 4 % Mort. Deb.	Do.	4	4	99¼ —101¼	..	3 18 10
Eastern Extension	10	7	7†	12⅜ — 12¾ xd	— ¼	5 5 8
Do. 4 % Deb.	Stock	4	4	99 —101	..	3 19 3
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98 —101	..	3 19 8
Globe Telegraph and Trust	10	6	6†	10⅜ — 11½	— ¼	5 7 7
Do. 6 % Pref.	10	6	6	12⅜ — 13¼	..	4 10 7
Great Northern Telegraph	10	18	18	28 — 29	..	6 4 2
Indo-European Telegraph	25	13	..	57½ — 59½	+ ½	5 9 3
Mackay Companies Common	$100	5	5†	86 — 89	..	5 12 4
Do. 4 % Cum. Pref.	$100	4	4	69 — 73	..	5 9 7
Marconi's Wireless Telegraph	1	20	..	5 — 5⅛	+ 1/16	3 18 2
Do. 7 % Cum. Partic. Pref.	1	17	..	4⅜ — 4⅝	+ ⅛	3 14 0
Monte Video Telephone, Ord.	1	6	..	1 1/16 — 1 3/16	..	5 1 1
Do. 5 % Pref.	1	5	5	13/16 — 15/16	..	5 6 8
National Telephone Def.	Stock	6	..	156⅓ —158½	—1	..
New York Telep., 4½% Gen. Bnds.	100	4½	4½	100 —101	— ⅛	4 9 1
Oriental Telep. and Elec.	1	8	..	1⅜ — 1⅞	..	4 5 4
Do. 6 % Cum. Pref.	1	6	6	1 3/16 — 1 5/16	..	4 18 5
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 9 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	10	10	10†	11⅞ — 11⅝ xd	+ ⅜	8 16 2
Submarine Cables Trust	Cert.	6	6	126 —129 xd	..	4 13 0
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½ —101½	..	4 8 8
United River Plate Telephone	5	8	..	7 7/16 — 7 11/16	..	5 4 1
Do. 5 % Cum. Pref.	5	5	5	5⅜ — 5⅝	..	4 8 11
West Coast of America	2½	2½	..	1 13/16 — 1 15/16	..	3 18 5
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	10	2½	..	3⅛ — 3⅜	..	..
Do. 6 % Cum. 1st Pref.	10	6	6	10⅜ — 11½	+ ⅛	5 7 10
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅜ — 10⅜	..	5 17 0
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd.	10	7	7†	18⅜ — 18⅞	..	5 1 0
Do. 4 % Deb.	Stock	4	4	96⅛ — 98⅛	..	4 1 3
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	98⅛ —101½ xd	..	4 8 8

* Unless otherwise stated, all shares are fully paid. *a* Paid in deferred interest warrants. † Interim Dividend. ‡ 3s. in Funded Dividend Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Oct. 22nd.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	* 1	Nil	Nil	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	11/16 — 13/16	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	76 — 81	..	5 11 1
Brit. Elec. Trac., 6 % Pref.	100	..	..	11½ — 13½	— ½	..
Do. Do. Deferred	100	..	..	6 — 8	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	89 — 92	..	6 10 5
Do. 7 % Non-Cum. Pr'f.	100	..	..	38 — 41	..	..
Do. 5 % Perp. Deb.	100	5	5	90 — 94	−3½	5 6 5
Do. 4½ % 2nd Deb.	100	4½	4½	79 — 83	..	5 7 2
Central London Railway, Ord.	100	8	8†	74 — 76	+1	3 19 0
Do. Pref.	100	4	4	83 — 85	−1	4 14 2
Do. Def.	100	2	..	73 — 75	+2	2 13 4
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
City & South London, Ord.	100	1⅝	1½†	40½ — 41½	−2	3 6 3
Do. 5 % Pref., 1891	100	5	5	107 —109	..	4 11 9
Do. Do. 1896	100	5	5	105 —107	..	4 13 6
Do. Do. 1901	100	5	5	105 —107	..	4 13 6
Do. Do. 1908	100	5	5	104 —106	..	4 14 4
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 3
Dublin United Trams, 6 % Pref.	10	6	6	12 — 13	..	4 12 4
Great Northern & City, Pr'f. Ord	10	Nil	Nil	2⅛ — 2⅜	+ 1/16	Nil
Hastings Trams, 6 % Pref.	1	6	6†	3/32 — 5/32 xd	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	69 — 74	..	6 1 7
sle of Thanet Trams, 5 % Pref.	5	2½	..	2 1/16 — 2 1/16	..	4 11 0
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	81 — 83	..	6 0 6
London Elec. Railw'ys, 4 % Deb.	100	4	4	95 — 97	..	4 2 6
London United Trams, 5 % Pref.	10	Nil	..	5⅛ — 6	+ 1/16	..
Do. 4 % Deb.	100	4	4.	72 — 76	..	5 5 3

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Oct. 22nd.	Rise + or Fall —	Present Yield p.c. £ s. d.
Metropolitan Railway Consol.	* 100	1⅛	1½†	53/32 — 54½	— 3/32	3 0 0
Do. Surplus Lands	100	2⅛	2⅝†	64 — 66	..	4 3 4
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	Nil	38 — 38⅛	— 1/32	Nil
Do. 6 % Deb.	100	6	6	141 —143	..	4 4 0
Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Do. 4 % Prior Lien	100	4	4	99 —101	..	3 19 3
Do. 4½ % First Pref.	100	4½	4½	88 — 91	..	4 19 0
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 11 0
Metropolitan Elec. Trams, Ord.	1	6	5†	1⅛ — 1⅜ xd	..	4 16 0
Do. Def.	1	Nil	..	1/32 — 1/16	..	Nil
Do. 5 % Pref.	1	5	5	1/16 — 1/8	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	95 — 97	—1	4 12 9
Do. 5 % Deb.	100	5	5	97½—100½	..	4 19 6
Potteries, Ord.	1	3½	..	3/32 — 1/16	..	..
Do. 5 % Pref.	1	5	5	1/16 — 3/32	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
South Metro. Trams, 6 % Pref.	1	6	..	1/4 — 1/2	..	7 7 8
Do. 4 % Deb.	100	4	4	70 — 75	..	5 6 8
Underground Elec. Railways	10	..	..	3/32 — 4	..	Nil
Do. "A"	1/-	..	..	3/32 — 3/16	..	..
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1½	£2	87 — 89	..	..
Yorkshire (West Riding), Ord.	5	Nil	..	1/4 — 3/8	..	Nil
Do. 6 % Pref.	5	3	..	2¾ — 3⅜	..	4 9 0
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4 13/16 — 5 3/16	+ 1/16	5 6 0
Do. 2nd Pref.	5	5½	5½	4 11/16 — 5 1/16	..	5 3 6
Do. 4 % Deb.	100	4	4	93 — 94½	— ½	4 4 8
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	99 —101	..	4 19 0
Auckland Trams, 5 % Deb.	100	5	5	103½—105½	..	4 14 9
Bombay Elec. S. & Trams, Pref.	10	6	6	11¼ — 12	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	98 —100	+ ½	4 10 0
Do. 5 % 2nd Deb.	100	5	5	98 —100	..	5 0 0
Brisbane Trams Invt., Ord.	5	8	..	7 3/4 — 7 3/8	..	5 3 3
Do. 5 % Pref.	5	5	5	5 — 5 1/8	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	100½—103½	..	4 7 0
B. Columbia Elec. Rly., Def.	100	8	..	142 —147	+1	5 8 10
Do. Pref. Ord.	100	6	6	115 —119	+3	5 0 10
Do. 5 % Pref.	100	5	5	104½—107½	+ ½	4 13 0
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98 —101 xd.	..	4 9 1
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	101 —103	..	4 2 6
Calcutta Trams, Ord.	5	7	5†	6 — 6⅛ xd	— ⅛	5 7 8
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 8
Cape Electric Trams	1	2½	..	1 1/16 — 1 1/8	+ 3/32	..
City Buenos Aires Trams (1904)	5	5	5†	5¼ — 5⅜	..	4 6 11
Do. 4 % Deb.	100	5	5	99 —102	..	4 18 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	95 — 99	..	5 1 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 5/32	..	Nil
Do. 5 % A Deb.	100	5	5	86 — 91	..	5 10 0
Do. 6 % B Deb.	100	6	3	35 — 43	..	..

La Plata Elec. Trms, Ord.	1	Nil	..	3/32 — 5/32	..	..
Do. Pref.	1	6	..	3/4 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	..	1 1/16 — 1 5/16	..	4 11 5
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	93 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5	5	100 —102	..	4 18 0
Manaos Trams & Lt., 1st Deb.	100	5	5	92 — 95	..	5 5 3
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½—102½	..	4 17 7
Mexico Trams Com.	$100	7	7†	113 —116	—2½	6 0 8
Do. Gen. Con. 5 % Bonds	..	5	5	95 — 97	—1	5 3 1
Do. 6 % Bonds	100	6	6	99 —101	..	5 18 10
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7 5/16 — 7 7/16	..	6 12 5
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	100½—102½	..	4 17 6
Perth (W.A.) Elec. Tr., Ord.	1	5	5†	1⅜ — 1⅝	..	1 16 4
Do. 5 % 1st. Deb.	100	5	5	99 —102	..	4 18 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5½ — 5⅝	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	..	4 11 0
Rio de Janeiro Trams	$100	5	5†	155 —160	+9	3 2 6
Do. 1st Mort. 5 % Bonds	..	5	5	100½—102½	+ ½	4 17 7
Do. 5 % Mort. Bonds	100	5	5	95½ — 97½	..	5 2 7
Sao Paulo Tram, Lt. and P.	$100	10	10†	265 —275	+7	3 12 9
Do. 5 % 1st Deb.	$500	5	5	102 —104	..	4 14 4
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	..	5⅝ — 6⅛	..	5 14 3
Do. 6 % Pref.	5	6	..	5 — 5⅛	+ ⅛	5 9 1
Do. 5 % 1st Deb.	100	5	5	101 —104	..	4 16 2
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	101 —103	..	4 7 5

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	1/2 — 3/4	..	8 0 0
Do. 6 % Pref.	1	6	6	3/4 — 1	..	7 7 8
Babcock & Wilcox	1	28	14†	3 — 3½ xd	— ⅛	4 6 2
Do. Pref.	1	6	6	1 7/8 — 1 15/16 xd	..	3 16 10
British Aluminium, Ord.	1	Nil	..	3/4 — 7/8	..	..
Do. 6 % Cum. Pref.	1	Nil	..	3/4 — 7/8	..	..
Do. 5 % Prior Lien Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	86 — 89	+1	5 12 4
B.I. & Helsby Cables	5	10	8†	7⅞ — 8	..	6 5 0
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 14 1
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 96	..	4 13 9
British Westinghouse, Pref.	3	Nil	Nil	1/2 — 3/4	..	Nil
Do. Deb.	100	4	4	60 — 63	..	6 7 0
Do. 6 % Prior Lien	100	6	6	99 —102	..	5 17 8
Browett, Lindley, Ord.	1	..	..	2/- — 3/-	..	Nil
Do. Pref.	1	..	..	4/6 — 5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — 1/4	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	75 — 80	..	6 5 0
Do. 4½ % Deb.	100	4½	4½	47 — 52	—3	8 13 2
Do. 4½ % Second Deb.	100	4½	4½	35 — 40	..	11 5 0
Callender's Cable	5	15	..	10¼ — 11	..	6 16 4
Do. Pref.	5	5	5	4¾ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	99½—101½	..	4 8 8
Castner-Kellner	1	20	15†	3 1/16 — 3 3/16	+ 1/16	5 4 9
Do. Deb.	100	4½	4½	105 —108	..	4 3 4

Crompton & Co.	3	Nil	..	1/8 — 3/8	..	Nil
Do. Deb.	100	5	5	56 — 66	..	7 11 6
Dick, Kerr	1	5	Nil	1/16 — 1/8	+ 1/16	..
Do. Pref.	1	6	6	3/8 — 3/4 xd	..	6 17 2
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £3 paid	5	Nil	..	1/16 — 1/8	— 1/16	Nil
Do. fully paid	5	Nil	..	1/4 — 2	— ¼	Nil
Do. 4 % Deb.	100	4	4	65 — 69	..	5 16 0
Do. 5 % Second Deb.	100	5	5	72 — 75	..	6 18 4
Electric Construction	2	2½	3¾	3/4 — 1	..	7 10 0
Do. Pref.	2	7	7	1½ — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7½ — 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, Pref.	10	5	5	10 — 11	..	..
Do. Deb.	100	4	4	90 — 95	..	4 4 3
Henley's, Ord.	5	17	5†	12½ — 13	..	5 15 5
Do. Pref.	5	4½	4½	4¼ — 5½	..	4 7 10
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
India-Rubber, G. & T.	10	..	..	11 — 12	— ½	..
Do. Pref.	10	5	5	9½ — 10½	..	4 17 7
Telegraph Construction	12	17½	5†	84 — 86	..	6 13 4
Do. Deb.	100	4	4	98 —100	..	4 0 0
Willans & Robinson	1	Nil	..	1/8 — 1/4	..	Nil
Do. Pref.	5	Nil	..	3/4 — 1	..	Nil
Do. Deb.	100	4	4	58 — 60	..	6 13 4

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 17th, 1912.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING SEPTEMBER, 1912.

We publish herewith statistics of the exports and imports of electrical material during September, from which it will be seen that the former—totalling £634,879—were considerably higher than in the previous month, due to the inclusion of a large submarine cable export to New South Wales.

Apart from the telegraphic exports, which were valued at £232,592 for the month, the returns disclose a decided falling off in machinery and telephonic exports, with, however, increased cable exports as a saving feature. The latter reached £129,943 in value, and thus eclipsed the previous month's record value.

The import section also witnessed a considerable increase as compared with the August returns, the figures being £194,090 and £205,656 respectively, although in this case the only considerable increase occurred in lamp importations, which, as a whole, amounted to over £34,000 in value, other items, such as machinery, cables, telegraphic and telephonic material, showing only slight improvement over the August figures.

In the re-export section, the total of £20,115 shows a falling away from the £23,741 recorded in the preceding month.

While New South Wales was our best customer during the month, owing to circumstances mentioned above, our business with Japan and Canada also reached a high level.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	714	14	83	15	139	368	6,859	70	198	40	564	911	9,975
Germany	2,606	7,212	27	...	427	140	1,400	615	6	252	255	425	13,365
Netherlands, Java & Dutch Indies & Borneo	609	1,720	170	24	93	11	1,144	...	22	...	33	736	4,562
Belgium	462	473	94	15	50	12	2,231	974	3	10	299	139	4,762
France and French Indo-China, &c. ...	448	...	3,313	...	...	10	6,942	73	636	...	42	760	12,224
Portugal	233	260	...	20	...	5	617	...	21	3	196	63	1,418
Spain, Canary Isles and Spanish N. Africa...	955	4,743	160	...	...	88	5,749	920	13	...	744	50	13,422
Switzerland, Italy and Austria-Hungary ...	727	75	134	...	95	...	3,003	22	70	61	85	1, 634	5,906
Greece, Roumania and Turkey	293	490	...	...	71	...	605	5	2	...	115	1,927	3,508
Channel Isles, Gibraltar, Malta and Cyprus...	93	216	...	...	24	34	162	7	48	...	7	289	880
U.S.A., Philippines and Cuba	1,149	55	78	76	...	11	841	...	164	22	...	172	2,568
Canada and Newfoundland	1,533	19,522	1,160	2,215	...	3,072	7,911	...	287	...	1,895	12,300	49,925
British West Indies and British Guiana ...	...	33	56	224	...	...	220	13	19	2	125	45	737
Mexico and Central America	19	3,435	5	...	...	...	149	...	2	...	138	219	3,967
Peru and Uruguay	151	886	40	55	...	16	869	15	...	...	...	2,471	4,503
Chile	458	764	152	156	...	28	4,847	...	204	...	...	254	6,863
Brazil	773	1,533	354	1,194	...	155	6,556	2,271	666	38	13	4,299	17,852
Argentina	2,881	9,961	257	572	462	897	9,584	349	2,113	83	4,459	3,397	35,015
Colombia and Venezuela	101	...	...	...	...	...	...	...	...	...	150	264	515
Egypt, Tunis, Morocco and Persia	784	94	166	26	15	37	532	49	194	...	35	610	2,542
British West Africa	28	74	253	80	...	...	838	3,096	17	6	222	273	4,887
Rhodesia, O.R.C. and Transvaal	2,908	837	485	1,192	31	181	2,375	1,287	364	108	369	1,415	11,552
Cape of Good Hope	1,456	897	214	188	48	400	1,682	259	61	14	128	230	5,577
Natal	969	6,278	767	250	...	12	3,962	170	402	...	42	752	13,604
Zanzibar, Brit. E. Africa, Mauritius and Aden	295	43	61	176	10	79	597	84	81	...	453	52	1,931
Azores, Madeira and Portuguese Africa ...	211	2,744	25	83	...	69	1,161	6	106	...	...	10	4,415
China and Siam	1,401	462	152	1,484	92	1,101	3,180	36	544	222	15	515	9,204
Japan and Korea	282	23,067	5	...	...	3,087	21,462	4,968	2,505	46	4,155	146	59,723
India	3,841	9,143	2,566	2,201	121	927	9,376	2,446	2,813	316	1,603	1,337	36,690
Ceylon	393	239	117	185	...	53	33	338	78	13	68	111	1,628
Straits Settlements, Federated Malay States and Sarawak	307	813	147	101	115	135	760	69	53	325	67	4,033	6,925
Hong Kong	805	2,520	97	100	64	248	518	443	593	17	54	47	5,506
West Australia	476	36	64	286	...	...	684	...	14	11	140	453	2,164
South Australia	2,592	1,072	286	304	21	40	402	27	113	...	236	1,065	6,158
Victoria	4,489	8,915	645	913	...	394	3,221	373	700	39	4,625	11,169	35,483
New South Wales	3,658	10,713	958	1,205	...	148	11,706	1,014	2,719	24	263	171,102	203,510
Queensland	260	2,035	12	281	...	39	1,066	...	209	...	...	69	3,971
Tasmania	168	2,602	...	...	...	...	...	...	...	...	61	...	2,831
New Zealand and Fiji Islands	835	5,967	911	285	...	541	6,205	286	245	42	446	8,848	24,611
Total, £	40,363	129,943	14,014	13,906	1,878	12,338	129,479	20,285	16,285	1,694	22,102	232,592	634,879

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Norway, Sweden and Denmark	21	...	23	132	...	...	7,526	120	405	4	7,561	15,792
Germany	6,674	7,540	601	18,612	8,773	1,945	55,651	2,883	5,225	7,327	18,518	133,749
Holland	...	...	...	654	779	...	1,985	...	...	...	...	3,418
Belgium	243	1,733	14	157	112	129	3,931	...	280	22	6,814	13,435
France	420	78	215	1,698	267	326	1,725	82	1,016	2 949	629	9,405
Switzerland	128	1,069	36	51	4	61	1,308	...	...	10	940	3,607
Italy	20	714	...	...	...	...	...	...	...	...	2,517	3,251
Austria-Hungary	...	1,300	3	664	89	...	290	...	6	153	...	2,505
United States	1,812	371	565	135	2,090	42	6,580	7,915	144	5	339	19,998
Canada	125	...	...	40	...	...	...	250	...	...	6	421
Total, £	9,443	12,805	1,457	22,143	12,114	2,503	78,996	11,250	7,076	10,470	37,324	205,581

Additional imports: Spain, carbons, £75.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above ...	9,765	789	...	1,253	475	...	7,133	...	124	470	106	23,741

Total Exports: £634,879. Total Re-Exports: £20,115. Total Imports: £205,656.

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

A LIBRARY SCHEME FOR CATALOGUES AND PRICE LISTS.

[COMMUNICATED.]

Many attempts have been made to find a really efficient and satisfactory solution to the catalogue and price list difficulty, but judging by the fact that in most offices it is still the usual rule to find all sorts and conditions of this class of literature just dumped in untidy and dust-covered heaps, sometimes on shelves, but more often in odd corners on the floor, with no attempt or pretence at classification or arrangement, one is forced to the conclusion that no very satisfactory solution has as yet been found, or, if it has been found, is confined to the fortunate few.

That the draughtsman, cost clerk, or estimator, who has to make frequent recourse to catalogues and price lists, would welcome some system of classification is certain. It is most annoying and absolutely ruinous to the best temper to have to make periodic searches for a particular list, which may extend over five minutes, or possibly may last for half-an-hour or more, and having obtained the desired article, to find that one's hands are covered with dust, and that probably in pulling down heaps of lists, one has received a generous shower bath of dust. Before work can be resumed a thorough wash and brush up have to be indulged in. Even if success rewards the searcher in the end, it is a most unsatisfactory state of affairs; but it is often the case that the list required is not forthcoming, and it is only after a general hunt that it is discovered, say, in the drawer of some more enterprising young gentleman who has had occasion to use it a month or so ago, and either forgot to return it, or else having had a similar experience in obtaining it, has kept it by him with an eye to further requirements.

As has been said, such an experience is, to say the least of it, annoying to the individual, but it is also a most serious thing looked at from an economical point of view. In an office of this description (and, alas, only a very slight exaggeration has been made of the conditions existing in the majority of offices) the amount of time wasted in this way is enormous, and it is almost always the time of a highly-paid man, because it is practically useless to send a junior on a search of this kind. Consequently the finding of catalogues becomes a most serious item in the establishment charges.

Again, it is simply marvellous what an amount of space can be occupied by lists stored in the way described; partly because no attempt is made to eliminate "out of dates," and also because there is no check on the multiplication of the same lists. On close examination, it is sometimes possible to discover that at some remote period an attempt had been made at classification; but, in most cases, this leads to confusion worse confounded. One finds a ticket stuck on the front of the shelf "Dynamos and motors," let us say, and requiring a little information concerning squirrel-cage machines, one searches through the heaps over this ticket only to find lists of iron and steel, a few lathes, pattern-shop requirements, and, in fact, everything and anything except dynamos and motors. Someone, for greater ease of search, had at some time removed the correct pile to his desk and either forgot or did not think it worth while to return it. Someone came along with a new consignment of lists, hailed the empty space with delight, and promptly filled it. Result: chaos.

The harrowing story might be continued *ad lib.*, but since the experience is pretty general, it is hardly necessary to dwell upon it. The question is, can a simple library scheme be devised, and one which can not only be applied to the formation of a new library, but also to the reformation of an existing dust and rubbish heap? It must be as simple as possible and, at the same time, elastic. It must enable the least-called-for list to be found at a moment's notice. It must be so appointed as to give the fullest information to manager, draughtsman, estimator, stores buyer and cost clerk. It must be as cheap in first cost and maintenance as possible, since the deviser can hardly hope to be credited with a reduction in the establishment charge, although such will follow naturally, but he will undoubtedly have to answer or any outlay entailed.

In describing the following scheme, every proposal has purposely been made in its very simplest form, and in some cases the writer may be accused of crudeness. The reason

A.

Subject.	*File No.*
Accessories, drawing office	12
,, gas and oil engines	10
,, pattern shops	24
,, steam engine	3
Advertising	1
Alloys	5
Aluminium	7
Angle iron	30
Appliances, gas	15

Fig. 1.

is that it is always easy to amplify a simple system and give an opportunity for exercising one's individual tastes, but it is a most difficult matter to simplify a complicated system.

Then, again, every different kind of factory will require to make certain modifications to suit its own requirements. Hence, it is only waste of time and space to elaborate in every detail a fixed scheme. The present library scheme is offered with the certainty that it will be found to be a great time saver and a real addition to the efficient equipment of any factory or office. That there are difficulties in the way goes without saying, the present state of chaos is sufficient proof of this. Perhaps the greatest of these is the great variety which exists in the size, shape, and method of binding. Uniformity in size has been advocated again and again, but the realisation is still more or less a dream, and, it is feared, likely to remain so. Consequently, it becomes necessary to group the catalogues in some way.

To commence with, let us differentiate between bound and unbound lists. It will be found that the unbound lists, which are the class which gives most trouble, are hardly ever of such large dimensions that they cannot be accommodated in an ordinary box file. Extra large ones are few in number, and may be folded to fit in. It is therefore decided to use box files, since these are compact and will hold at the same time a good number of lists, and, above all, exclude dust.

In dealing with collections of lists already in stock, it is best to commence by dividing them into groups under general headings, denoting the subjects, as "shafting and shaft fittings," "steam engines," "boilers," "switchgear," "dynamos and motors," and so on. These groups of papers will in all probability be found too large for convenient handling, and must therefore be sub-divided. It is obviously better to err on the side of too full division than the reverse, because the process of finding a required list is thereby rendered easier. The degree of sub-division is therefore left to individual discretion and taste.

Once the groups are arranged in the desired manner, the next proceeding is to make an index of the groups, which will be called the "subject index." Each subject is then

D.

Name of firm.	*Initial in thumb-index.*	*File No.*
Dawson, John, Ltd.	D.	1. 17
Dearing, Alfred Smith, and	S.	30
Dickson, Samuel, & Co.	D.	2. 5. 9
Dombey, Willis and	W.	15
Durnford, Atkinson, Mills, & Ltd.	A.	24

Fig. 2.

given a distinctive number, which is included in the index. The subjects should be arranged alphabetically for ease of reference, and all that is necessary is to type the lists under each initial, and file them in a box file with thumb index. Additions and alterations may then be made when required with a minimum of expense. Each subject will, in all probability, cover several sub-divisions, so that it might be found convenient to amplify the index by a finer sub-division that is made in filing.

Thus, in the case of "shafting and shaft fittings" indexing, it would be an assistance if in the index there appeared "pulleys," "plummer blocks," "hangers," "wall boxes," and so on, each under its own initial, and with reference to the same file number. This is, however, a matter which may be conveniently left to the judgment of the librarian.

A sample extract from the subject index is given in fig. 1. A box file is next provided for each subject number, which is marked distinctly on the back, or if the number of lists is

too great for accommodation in one file, more must be added. These must bear the subject number, and in addition the letters *a*, *b*, *c*, &c., as a suffix according to the number of files required. For instance, if three files are required for Subject 5, they must be numbered 5, 5*a*, 5*b*. Each file is to be provided with a thumb index, and the lists are then filed under the advertiser's initial in groups as already arranged. It is, therefore, seen that by referring to the subject index, we may with the greatest ease find all lists relating to that subject, and then by means of the thumb index in the file discover any particular advertisement under the advertiser's initial. Sometimes it is required to find a certain well-known advertiser's list without reference to the subject, and therefore for the purpose, an alphabetical list of advertisers is arranged and called the "advertiser's index." For this purpose a file similar to that used for the "subject index" is founded.

In the case of compound names, the advertiser should be indexed under the initial of each separate name, thus:—Smith, Jones & Brown, Ltd., should be indexed under S, J and B, since the full name may not be remembered when required. In this index the first column should contain the full name of the firm, the second column the initial under which he is indexed in the thumb index in the files, and the third column the numbers of the files in which he appears. A sample extract from such an index is given in fig. 2. Where a firm describes several articles which come under different headings in the subject index, if the advertiser does not issue loose sheets, the whole list may itself be filed under the principal subject, dummy sheets being filed under the other subjects covered, on which is stated the subject heading or the file number under which the list is to be found. For instance, supposing Messrs. Clarke, Thompson are makers of steam engines, boiler fittings and superheaters; steam engines being the principal subject, and one list only being issued, this list will be filed under "Steam engines" in, say, file No. 21. In the files for each of the other subjects under C will appear a dummy sheet, as shown in fig. 3.

For Filing under Subject No. 11.

Name of Firm.	*Full list in file No.*
Clarke & Thompson	21

Fig. 3.

Catalogues which are too bulky for the files will, in all probability, be found sufficiently well bound to arrange on shelves. They should be grouped together alphabetically under the advertiser's initial. The catalogues under each initial should, if possible, be kept separate, and since it is easy to estimate the amount of space required for each group, the shelves may be partitioned off by uprights, leaving a liberal allowance in each pigeon-hole for additions. Another plan would be to devise some plan of movable partitions, which could be slid along as required. In the case of fixed partitions, each pigeon-hole should be plainly marked with the initial it is provided for. A separate index is not necessary for the bound catalogues. All that is required will be dummy sheets in the files under the advertiser's name, as shown in fig. 4. There must be a dummy sheet in all files covering subjects dealt with in the bound catalogues referred to. Discount sheets are to be filed separately in a file marked "discount." The filing should be done alphabetically under the advertiser's name. These should be kept as far as possible in the library itself, and should on no account be issued to any but responsible hands. In cases where printed discount sheets are not issued, but discount is quoted by letter, the letter or a copy should be filed in the discount file. So much for the organisation of the library. A set of shelves will, of course, be required for its accommodation, but these will in many cases be already to hand, or may be very easily and cheaply erected.

Now, to come to the maintenance. It is most important that one person, and only one person, should be responsible for the library. If anyone is allowed to take any list at any time, the whole system will break down in a week, and, in course of time, things will get back to where they were before the initiation of the scheme. A very suitable person to act as librarian is a junior clerk or a draughtsman. He should be big enough to exercise authority, and, as far as the library is concerned, should be responsible to no one but the manager. It is not necessary that he should be actually located in the library itself, though he should be near enough to prevent raids. When a list is required, a slip inscribed with the name of the list or lists should be presented to the

For Filing under Subject No. 3.

Name of firm.	*Full list in file No.*
Robinson & Weekes, Ltd.	Bound catalogue.

Fig. 4.

librarian, who files them, and, before issue, obtains the receiver's signature to the requisition slip. These slips may be merely odd pieces of paper or printed forms, according to taste. They should be filed pending the return of the list, after which they may be destroyed. At the end of the week—say, at noon on Saturday—the librarian, armed with the slips still remaining on his file, goes the round of the offices and collects all lists out, which he refiles in their proper places. In this way a constant check is kept on the lists and their whereabouts.

All new lists, immediately on receipt, should be taken charge of by the librarian, and brought before the notice of the management as soon as possible. Those decided on as being worth keeping are filed away at once.

In case of new lists being requisitioned, the librarian should set about obtaining these, but he should not do so without proper authority. Such is the idea of the library. It is, of course, open to amplification, and it is worth while investigating a few of the lines upon which it is advisable to proceed.

Catalogues get out of date, and require either replacement or confirmation. Obviously a large proportion of the total library is seldom referred to; consequently, to avoid a great deal of useless labour and expense in replacement, it becomes necessary to discover which lists are in most frequent use. For this purpose the requisition slips after the return of the lists should not be destroyed, but should be filed away for reference, and will form an index to the lists most often required. At the end of fixed periods, say six months, all lists found mentioned on the requisition file should be either replaced or confirmed. In the case of replacement the old list should not be destroyed, but filed away in separate files initialled for the advertiser's name. No thumb index will be required in these files, which will be known as "reference files." Into these files also go all lists of more than 12 months' standing. In the place of confirmation instead of replacement, a copy of the confirming letter should be pasted securely to the list, the letter itself being attached to the discount sheet if any is provided.

Lists two or more years old should be destroyed, but not on the authority of the librarian alone. Some responsible official should inspect the discarded lists and decide what is to be done with them. Lists passed for destruction should be burnt, and the librarian should be held responsible in this respect. Care should be taken to see that lists do not fall into irresponsible hands. In a large library it would be advisable to refile the lists most frequently requisitioned in a separate group of files known as the "current library." These files should bear the usual subject numbers, but with the prefix C, thus: C6, C30, and so on. Such a sub-division would be of great advantage to newcomers as an indication of the firms generally dealt with. Further, it is most likely that on reference to the requisition slips it would be found that certain officials regularly required certain catalogues, in which case these lists should be obtained in duplicate or triplicate as required, the spare copies being lodged permanently with the most frequent users.

A very useful addition to a library of this description may be formed in this way. In many of the technical journals of the day will be found a classified index of trades, or buyers' guide. A study of these will keep one in touch with new firms advertising. These lists should be cut out and filed in a separate file and marked "buyers' guide," and the sheets should be arranged alphabetically in a thumb index under the name of the journal from which they were taken. These sheets should be filed week by week regularly, the old sheets being destroyed when, say, a month old.

If the library is sufficiently large to warrant the appoint

ment of a librarian who shall give his whole time to it, his spare time may be very usefully employed in compiling and keeping up to date tables showing the comparative prices of various vendors for such articles as are most frequently in requisition in the factory or office concerned. For instance, in an electrical engineering works, tables might be prepared for such subjects as iron, steel and copper bars, tool steel, bolts and nuts, oils, and so on. The table might take some such form as that shown in fig. 5, and be kept up to date by frequent quotations. Notes as to the quality and general remarks should be added, and the firm usually dealt with may

PRICES OF:—

Name of firm.	Price per					Remarks
	Date.	In lots of.	Carriage.	D/y.	Price.	

FIG. 5.

be underlined in red ink. For trial purposes the blank tables might be very conveniently drawn out in the drawing office, and traced, blue prints being taken and used in the library, but if finally adopted, printed forms would probably be found cheaper.

Such is the system in its simplest form. Modifications and improvements will, no doubt, suggest themselves to the user. For small and medium-sized offices, no simpler and more satisfactory system can be devised. The first cost is confined to the outlay on files, which is insignificant. The labour involved in the organisation is not a large item, and that for the upkeep is practically negligible. In large offices the system will bear a good deal of expansion, which will take the form chiefly of much greater detail in the sub-division and indexing, but this must be left to the discretion of the users.

If managers will only realise that their present dust heap is a most costly item in their running expense, it is certain that some such system as that suggested will be welcomed, and it is hoped not only that the present article will serve to impress upon them the advantages of a library, but also that although they may not follow precisely on the lines laid down, the suggestions made may form a sound basis for their own private scheme.

CO-PARTNERSHIP OR TRADE UNIONISM —WHICH?

BY FRANK BROADBENT, M.I.E.E.

"CO-PARTNERSHIP forms the most effective method of breaking down the hard line of division between Capital and Labour, which more and more induces conflict disastrous to the country." Such was the concluding sentence in the letter addressed to the Prime Minister last year covering the memorial signed by nearly 300 Members of Parliament, asking for the appointment of a Royal Commission to inquire into the practicability of applying the principles of co-partnership to the industries of this country. The report of the Royal Commission will, it is hoped, shortly be issued. It is significant that the letter from which the foregoing quotation is taken was signed by Members of Parliament representative of practically every section of the House of Commons *except* the Labour Party.

At the annual meeting of the Labour Co-partnership Association in 1911, a resolution was unanimously carried, expressing the belief that "the adoption of co-partnership would tend to harmonise the interests of Capital and Labour; increase industrial and commercial efficiency, and widen the ownership of property." The mover, Mr. Lleufer Williams, said that, coming as he did from the Rhondda Valley, he was convinced that a plan for harmonising the interests of Capital and Labour in coal-mining was absolutely essential, since 80 per cent. of the cost of coal was due to labour.

Similar expressions of opinion from men whose views command respect might be multiplied, and yet it would be difficult to find an accredited representative of organised labour, that is to say, a representative of Trade Unionism, who has ever said a good word for co-partnership. When Sir Christopher Furness four years ago offered to sell to the Trade Unions the shipyards owned by his company, or, alternatively, to make the workmen limited partners, practically everybody but the Trade Union leaders hailed the proposal as a serious and well-meant attempt to reconcile the interests of Capital and Labour, and to bring about a spirit of co-operation between employer and employed, in place of the existing spirit of antagonism.

But how was the proposal received by the leaders of the Labour Party, the party representative of the Trade Unionism of the country? Said Mr. J. Ramsay Macdonald, the then secretary of the Labour Party, "If this is another South Metropolitan Gas Works' scheme—and it seems to me a little worse than that—it is bad, and ought to be opposed. The limited co-partnership appears to be just the old idea that the late Sir George Livesey developed, and its purpose is to smash up Trade Unionism and to detach the workers from each other." It will be remembered that Sir Christopher Furness emphasised the fact that he had no feeling of antagonism towards the Trade Unions, and was quite willing to co-operate with them to bring about more harmonious relations between Capital and Labour.

Mr. Will Steadman, M.P., speaking for the Trade Union Congress Parliamentary Committee, said "Sir Christopher Furness sees labour no longer in the position it was, and he would alter the position at any cost to save his own skin. Thus it is he comes forward like the good fairy in the pantomime, with proposals not worth the paper they are written on."

Mr. Lee, the Secretary of the Social Democratic Federation, said that his party could not approve the proposition of Sir Christopher Furness, because they were dead against anything in the nature of profit-sharing between employer and employed. He considered that under such a system the men would sweat themselves to increase their bonus, and by over-production would bring about a crisis which would involve in disaster those who were working under similar conditions.

The opinions quoted above, and many more were expressed to the same effect, are in line with the report issued in 1904, signed by the officials of about 20 Unions, in which it is said that the premium system—a species of profit-sharing, "has absolutely nothing to recommend it; it is an adaptation of the most pernicious and degrading condition of employment in modern industrial history—the taskwork system . . It has been the cause of more men being discharged than any strike which has ever taken place in the history of the engineering or shipbuilding trades, and it will have the effect of keeping men whose waning physical powers unfit them for the closest and hardest labour, from obtaining employment, even when trade is at its busiest."

The premium system, which, as stated above, is a species of profit-sharing, is not co-partnership, but the above report not unfairly represents the spirit in which all profit-sharing and co-partnership proposals are regarded by the leaders of the Trade Unionist movement.

That there is no objection to profit-sharing among the rank and file of Trade Unionists is sufficiently obvious from the fact that most, if not all, the members of the Workmen's Co-partnership Societies are Trade Unionists. There are now 110 Workmen's Productive Co-partnership Societies, embracing a wide range of trades, in which a capital of about £2,000,000 is invested by the workers, who are both the employers and the employed.

That all these societies pay full Trade Union wages, and most, if not all, have adopted the eight-hour day, and that there is no such thing as a strike, or lack of employment among them form a sufficient refutation of the opinions expressed in the report just referred to.

In addition to paying the full Union rates of wages, the workers last year shared a profit of £228,000, which is 11 per cent. on the invested capital, £29,847 of the profits being distributed as dividend on wages.

These workmen's co-partnership societies do not, of course, include the gas companies in which profit-sharing has been adopted with such satisfactory results. "If this is another South Metropolitan Gas Works' scheme, it is bad, and ought to be opposed," said Mr. Ramsay Macdonald, in referring to the Furness scheme of co-partnery, yet about 40 gas companies have now followed the example of the "Metrogas," and have adopted the scheme of profit-sharing initiated by Sir George Livesey. The share capital invested in these profit-sharing gas companies is over £50,000,000. The number of employés in 1911 was about 22,300, and the amount of their shares and deposits now reaches a total value of £672,500, or about £30 per employé. Last year, in addition to interest on deposits, a sum of £103,418 was paid to the workers as dividend on wages; that is an average of about £5 each over and above the usual Trade Union wages. Since the gas companies took up profit-sharing, and, with the exception of the "Metrogas," only four of the 36 have had the system in operation for over three years, over three-quarters of a million—viz., £792,000—has been paid to labour as a dividend on wages. Everybody concerned—shareholders, consumers and workers—is satisfied, everybody except those Trade Union officials who fail to see in profit-sharing anything but an attempt "to smash Trade Unionism and to detach the workers from each other."

A short time ago the writer was discussing the subject of profit-sharing with an employer of labour who is firmly convinced that in one of his machine-rooms alone over £1,000 a year extra might be earned if the unions would allow the men to do their best, instead of deliberately restricting their output. And he would be quite willing to share this £1,000 with the men, in addition to paying full Trade Union rates. As an experiment, he tried profit-sharing for a short time in one department of his works, and the men received their proportion of the extra profit made. But they brought the money back in a week or two by order of the Trade Union officials, who would not allow them to keep it.

Profit sharing is now practised in many large company-owned works, each company having its own method of sharing. There is as yet no uniformity as regards the proportion of profits paid respectively to capital and labour. The fairest method would appear to be that adopted by Godin in the co-partnership system which he established at Guise, a system which has had such a wonderful record of success during the past 30 years. He treated capital as a wage-earner, the interest at, say, 5 per cent. per annum being reckoned as the wages of capital. It then receives *its* share of the profits over and above its wages of 5 per cent. at exactly the same rate as is paid to the workers on *their* wages. Thus, if the workers' wages amount to the same sum as the interest on capital, then capital and labour share and share alike. If wages are more or less than interest, the profits are divided in proportion to the respective amounts, each individual worker or shareholder receiving a sum directly proportional to his annual wages, and interest, if any, on shares. As the whole of the capital has now passed into the hands of the workers—an inevitable result of the system—the workers share the whole of the profits in proportion to their combined wages and interest on shares.

The Guise system is, moreover, a true co-partnership system, which simple profit-sharing is not. In a co-partnership system the workers share not only in the profits, but also, to a limited extent, in the management of the undertaking, and it is in this latter connection that one of the chief difficulties occurs in formulating an acceptable system.

It is easy to *talk* about co-partnership, and to those who have considered it only in the abstract it seems to be perfectly simple to apply it to almost any branch of industry. Those, however, who have tried to formulate a definite scheme for adoption in a particular case know that it is by no means so simple in practice as it appeared in theory. Experience in this, as in most other matters, should be the best guide, and those who are contemplating the adoption of a scheme of co-partnership will find much valuable information in the very detailed description of the methods by which Godin established and developed his unique system at Guise, published in a book under the title of "Twenty-five Years of Co-partnership at Guise."

There can be little doubt that the principles of co-partnership are gaining ground, and it has been said by one whose opinions were based upon exceptional experience that, by means of co-partnership, the working classes in the next generation will make as big a step forward in material prosperity as the middle classes did in the last.

We may believe this or not, as we like, but one thing is highly probable, and it is what the labour leaders fear, viz., that co-partnership will eventually supplant Trade Unionism; this will depend to some extent on the future attitude of official unionism, and, instead of bitterly opposing the inevitable, the best policy of the leaders of Trade Unionism would appear to be to take the path of least resistance and endeavour to formulate a working scheme in which the principles of co-partnership and those of Trade Unionism are harmoniously combined.

RECENT DEVELOPMENTS IN WIRELESS TELEGRAPHY: WITH SPECIAL REFERENCE TO SHIP INSTALLATIONS.

(*Continued from page* 635.)

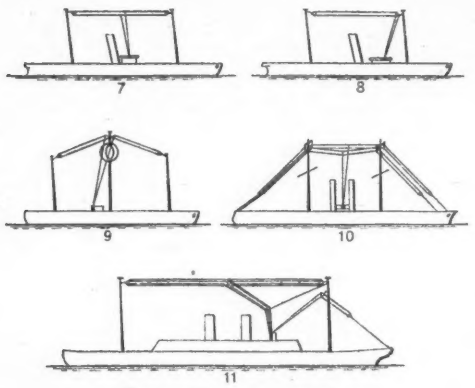
Location of Ship Stations.—In old vessels existing conditions often fix the position of the wireless equipment irrevocably, but, wherever possible, the spark-room should be amidships and on the upper deck, so as to make possible a direct vertical connection to the aerial. On passenger boats the wireless station should be easily accessible from the promenade deck; on cargo vessels the station should be as near the bridge as possible, and may conveniently be in, or adjoining, the chart-house; its location must not interfere with the look-out or steering arrangements. On men-of-war and armoured cruisers the station should be below decks, but on unarmoured vessels and torpedo-boats it should be placed above decks. If the station is placed below deck a clear tunnel, at least 1 m. sq., must be provided, so that the H.T. connections to the aerial may be at least ½ m. from the metal sides of the tunnel. The walls of the operating chamber should be "sound-proof," and good telephone connection should be provided to the bridge, engine room, and so on. The wireless room should have a floor area of 6 × 6 ft., if this can be arranged but in a certain German torpedo-boat the whole wireless equipment, excluding the transformers, which are placed in the engine-room, occupies only 1·2 × 1·8 m. On cargo steamers, where the wireless chamber is combined with the chart room, about 2·7 m. square is a sufficient allowance for the former. On passenger vessels, a more liberal allowance is necessary and can easily be spared. The D.C.-A.C. converter being located outside the operating chamber, under a weatherproof shield on deck, the apparatus room, living room for a staff of two men, and a small office for passengers, may be arranged within a total floor area of about 4¼ × 3½ m. Plenty of fresh air and direct lighting are imperative in the operating room.

Type and Arrangement of Aerial.—The antennæ should be suspended at as great a height as possible*, and the distance between the masts should be not less than twice the height of suspension of the aerial. The usual flag stays, spanned from top to top, must be replaced by stays running down to the funnel or spanned across the masts about half way up the latter. These stays should preferably be of hemp; if steel is used, insulators should be placed in the rope about 3 m. from each end. The exact importance of the metal structures adjacent to the aerial on steel ships has been much disputed. Undoubtedly a certain amount of the energy is absorbed and wasted by such structures, but it is doubtful whether the loss is sufficient to justify the means necessary to reduce it appreciably. It is obviously impracticable to sectionalise the masts by insulators, and though stay wires are easily fitted with insulators, saline moisture and tropical climates soon destroy the efficacy of the latter, hence the wisdom of their installation is very doubtful. The aerial network is, of course, insulated as perfectly as possible from the ship's frame and metal connected thereto, and deteriorated insulators must be replaced as often as necessary—fortunately a comparatively easy process.

The precise arrangement of the aerial network in any particular case is determined by the class of vessel concerned, the rigging arrangements and the range of transmission to be provided. The simplest disposition is secured by placing the aerial amidships. Fig. 7 shows the standard T aerial, connected to the operating chamber by vertical leads from the centre of its span; fig. 8 shows the L arrangement, only differing from the T in the point of connection of the downtakes. Fig. 9 shows an aerial arrangement suitable for lightships, and fig. 10 represents the antennæ of a large warship where, to get a long wave length, the aerial has been extended to the bow and stern and, to get large capacity, twin networks are mounted side by side and interconnected. A special arrangement in use on the Lloyddampfer *Bremen* is shown in fig. 11; the large T aerial is used for ordinary traffic and the small aerial forward, carried from a single mast, serves for emergency duty (over a much reduced range, of course). The availability of such an auxiliary aerial—permanently erected or ready for instant rigging—is of great importance to war vessels.

* Thus increasing the range of transmission and reception: see fig. 6 and Austen's formulæ, *loc. cit.*

Materials and Insulators.—Antenna wires must combine strength with lightness and small exposed area for given mechanical strength; they must resist corrosion by sea air, and be capable of easy stowage and easy erection and repair at sea. Trial has been made of stranded copper cable with stranded steel core; electrically the combination is satisfactory, but the steel soon rusts, and the



Figs. 7, 8, 9, 10 and 11.

cable then breaks by its own weight. A bronze alloy combining maximum strength with minimum resistance is found to give the best results; special clamps are used to make aerial connections.

The insulators used to isolate the antennæ (electrically) from direct earth connections or leakages must combine electrical and mechanical strength with lightness and capability to withstand the conditions encountered in tropical seas. Figs. 12-14 inclusive

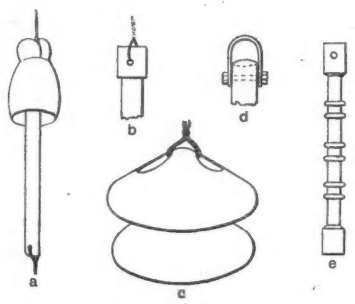


Fig. 12.

illustrate a number of types which have been employed by the Telefunken Co. during the past few years. The chief advantages and limitations of each pattern will be gathered from the following notes:—

Fig. 12a.—This represents an ordinary insulator with a long, screwed vulcanite pin; the whole is deficient in mechanical strength.

Fig. 12b.—A simple vulcanite construction of considerable strength, but ill-adapted for use in hot, moist climates.

Fig. 12c.—A cheap form of ordinary high-tension insulator; electrically good, but of too great weight and exposed area to suit aerial work.

Fig. 12d.—A glass block bored for cross bolts carrying stirrups at either end; a number of blocks generally used in series. The construction is cheap and suitable for moderate voltages; the blocks are easily broken, and yield rather a heavy construction.

Fig. 12e.—The leakage surface of a glass rod is increased by circumferential ridges, but such insulators are brittle and very easily broken.

Fig. 13a.—In this, the simplest of a number of "egg" types, porcelain blocks of elliptical section are provided with crossed grooves for the accommodation of the steel suspension links. Unfortunately, the latter are easily displaced, and the leakage surface of the blocks is small.

Fig. 13b.—An improved form of 13a, in which perforations are provided for the wires; this has been in constant use since 1907.

Fig. 13c.—This represents an intended improvement of the "egg" type. Long blocks increase the length of the leakage path, but the thinness of the walls between the grooves makes the resistance to earth very low.

Fig. 13d.—Bobbin-type glass insulators are held between vulcanite side plates, the mechanical pull being taken by iron strap plates outside the latter. The weakness of the design lies in the too severe stressing of the brittle glass blocks.

Fig. 13e.—An attempt is here made to provide strength and insulation by two independent elements. The pull on the insulator is transmitted through a fine silk-hemp rope, over which a porcelain tube is drawn, the interstices being run full of paraffin wax—to improve the insulation and exclude damp. The bell cover prevents sparking. This type of insulator is satisfactory when first placed in service, but heat from the flue gases, and from the sun in tropical latitudes, melts the paraffin, and the insulation then deteriorates.

Fig. 13f.—An improved form of fig. 13e, the rope and porcelain tube being now replaced by a vulcanite rod.

Fig. 14a.—The stout glass tube here employed is much less liable to breakage than most other types depending essentially on glass.

Fig. 14b.—This is the type most generally used on German ships (Rendahl type). The pull is taken by a wooden rod surrounded by a porcelain tube, the intervening space being filled with oil

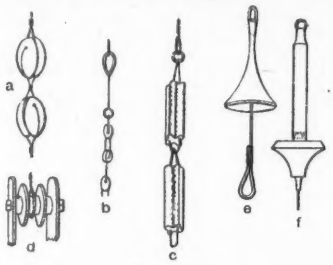


Fig. 13.

Sleeves are placed on the end of the wood for connecting purposes, and the end-shields prevent spark discharges across the insulators.

Fig. 14c-f.—Show other types of insulator in more or less general use; the constructions are obvious from the sketches.

Where H.T. aerial connections have to be carried through walls, excellent insulation must be provided, and by such means that negligible capacity leakage to earth can occur at the penetration

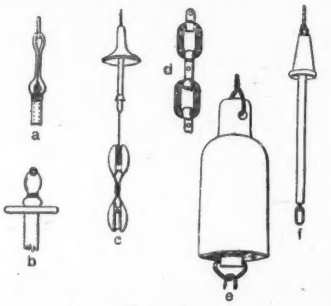


Fig. 14.

point. Fig. 15 shows various types of insulators specially designed to meet the needs of such cases. A simple bushed vulcanite tube with glass bell rain shields is shown in 15a; figs. 15b and c illustrate commercial types of "lead-through" porcelain insulators, complete with the necessary copper through conductor; fig. 15d

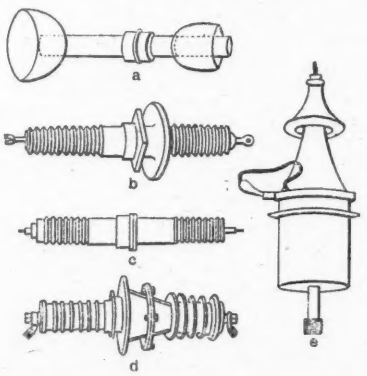


Fig. 15.

represents a somewhat similar type specially designed for submarines, and therefore provided with waterproof flanges and joints. One of the latest types of through-insulators (fig. 15e) consists of a porcelain tube carrying the conductor and surrounded by a porcelain cylinder. The whole is fixed to the wall by a metal flange which simultaneously provides for earthing the aerial. Ample insulation and minimum capacity effect are secured.

(*To be concluded.*)

Correspondence Stolen.—The letter box of the British Central Electrical Co. was again broken open on 17th inst., and correspondence was stolen. Will writers of such letters send copies?

GHENT INTERNATIONAL EXHIBITION, 1913.

Following up our recent comments, we are now able to give some further information with respect to the above event, also regarding an importance to British manufacturers in connection with their export trade.

One of the most interesting features in the British sections will be an admirable display of machine tools made by British manufacturers. Their fine show at Olympia we have already referred to in our pages. From among this wide range of exhibitors a representative number have already decided to take part at Ghent in order to place before Continental buyers an adequate idea of the pre-eminence in excellence of British tools for every purpose. Belgium itself, with its low tariff, furnishes an excellent market, and the neighbouring countries of Holland and Denmark are valuable customers.

The exhibition of foreign tools in the South African market which has been on view in London, Birmingham and Sheffield, illustrates only too well what is going on in this great Colonial field. While the percentage of tools supplied by British firms has fallen from 49 to 38, the German makers have increased their sales from 5 per cent. to 10 per cent., and Sweden has also gained 3 per cent. the United States being virtually stationary.

It is anticipated that the British display at Ghent will include machine tools, radial drills, pneumatic and electric tools, air compressors, pumping machinery, saw-sharpening machinery, bolt-screwing and nut-tapping machines, ball bearings, feed-water heaters, water-power plants, pumps, power hammers, drilling machines, shafting and power transmissions, double helical and reduction gears, magnetic clutches, lathes, planing and shaping machines, driving chains, drop forgings, engines, electric lighting and pumping plants, crushing, grinding, screen separating, dust collecting and ventilating machinery, wood-working machinery, welding apparatus, belting, &c.

The practical help given by the Government to British sections of International Exhibitions is planned on good business lines, and there is now a continuous instead of spasmodic policy, and, as our readers know, it is under permanent expert management. Broadly speaking, it may be said that the policy of the Board of Trade is to encourage good representative displays of the British manufactures most in demand in the countries concerned. In past years a few big manufacturers have made fine individual displays, but the British sections have been belittled by the speculative nobody. For instance, at Milan a number of so-called "British firms" were engaged in selling "diamond" brooches and scarf pins at 1s. and 6d. Thanks to Government supervision this sort of thing has been put an end to.

To come to practical points, the Board of Trade now secure for the British exhibitor the most favourable rates of carriage, arrange cartage (at Ghent this average 6s. per ton daily), send an erecting staff, undertake all decorations, provide show-cases and window dressers and signs. All these items, which have been found a costly business for the exhibitor, are now dealt with by the Board of Trade and are included in the space charges, which are virtually lower than those charged at trade exhibitions at home. Another valuable help is given by the Government's expert engineer, who sees that suitable concrete foundations of sufficient strength are provided where necessary. Another item is the translations necessary for the exhibition catalogue. The exhibitor is thus able to figure out fairly accurately the cost of his exhibit, an item which he has never been able to calculate previously.

In dealing with a Government vote, it is of course essential that the expenditure should be for the benefit of a community and not for any individual firm or group. By securing representative collective exhibits the benefits resulting are not merely for the firms contributing to the exhibit, but indirectly for the advancement of the entire industry and every one connected with it. Continental exhibitors have worked successfully on these lines for many years. For instance, at Dusseldorf a complete picture was given to the Rhenish iron industry, with the result that a tremendous impetus was given to the entire field of enterprise. Brussels and Turin each furnished successive examples of the policy when applied to a leading British industry. At the former, Bradford made a splendid display of the woollen trade. The collective setting is believed to be the best not only from a business but from a public point of view. Comparison with other countries is more readily made and a stimulus is given to improvements. Alkali and Redditch manufacturers have also found satisfactory results by working on these lines, and at the Belgium International Exhibition at Ghent next year the special display of the textile trades and machine tools should be found to have even more satisfactory results.

It is hoped, as we mentioned a fortnight ago, that something tangible may be done along the same lines by British electrical machinery and apparatus manufacturers.

A popular delusion in regard to Belgium is that, being of small size, it is only of small account, but Belgians, like Britishers, have won their laurels as administrators in pretty well every country of the world, and have "many irons in the fire" in Russia, China, Egypt, Persia, and other countries, to say nothing of their valuable Colonial rights in the Congo. In the Russian Empire alone, it is estimated that there is $140,000,000 of Belgian capital sunk in developing Russian mines and other industries. There are over a hundred big concerns of Belgian origin in the Muscovite Empire, about half of them consisting of coal and iron mines, petroleum wells, metal and glass works, while no fewer than 16 tramway systems are owned by Belgium. This alone will give some idea of the value to manufacturers of machinery and machine tools of meeting Belgian capitalists at the Ghent Exhibition next year. Our Continental rivals are making bold bids to capture their orders, and it will be impolitic in the extreme not to show British supremacy in manufacture wherever possible.

Still another opening for big business will present itself in the Far East, as the King of Siam has placed the development of his country's vast resources in Belgian expert hands. Egypt again is a striking example of Belgian enterprise, the service of trams in Cairo being owned by a Belgian syndicate. The Congo, however, offers an even wider field of possibility.

All these points are proof of the interests acquired by Belgium in every quarter of the globe, which are certain to control valuable industrial expansion in a short time, and which should direct the attention of the British manufacturer to their national enterprise in planning another exhibition which will surpass in many respects any previous effort, and which will have profited considerably by the experience that was gained at Brussels and Liége.

Belgium itself is the home of industrial activities very much like our own and very near—coal mines, smelting furnaces, iron foundries, glass works, machine factories. The recent discovery of extended coalfields improves the future outlook of Belgian manufacturers, adding many years of life to their fuel supply. Flanders has been famous for centuries for its skill in the textile arts—its countrymen were indeed the pioneers of some of them in England and Scotland—and there is so great and growing an interchange of business between the two countries that the more we know of each other the better for the further exchange of business relations. It is likely that there will be many visitors from other countries. From our own shores, too, the journey can be easily accomplished in, say, half-a-dozen hours—and we understand that every facility will be arranged to add to the comfort and enjoyment of a popular business trip.

We have before us a copy of a "Memorandum of Information for British Exhibitors" at Ghent Exhibition, issued by the Board of Trade Exhibitions Branch (Queen Anne's Chambers, 28, Broadway, Westminster, S.W.), and copies of this, as well as any other required particulars, can be obtained either on application to that address or to the London offices of the Exhibition. In the "Memorandum" referred to the terms are given for space, as well as for motive power, lighting, and water supply. The conditions of installation include the following:—"Exhibitors will be required to carry out their own installations of water and gas pipes and electric wiring and accessories, in accordance with the regulations of the Belgian authorities." Copies of these regulations will be supplied on application.

For the purpose of supplying continuous current in the British section, one British manufacturer has offered to supply on loan a 300-kw. six-pole horizontal-divided six-phase rotary converter running at 1,000 r.p.m., suitable for converting from 50 periods, approximately 310 volts, to 440 volts on the continuous-current side, complete with field rheostat; also one squirrel-cage induction starting motor for the above rotary, mounted on the end of the shaft. There will also be lent a transformer reducing the pressure of the three-phase supply from 6,000 volts to the voltage of the rotary converter. Another British manufacturer is lending a switchboard with the necessary switches, fuses and instruments.

THE ENGINEERING EXHIBITION AT OLYMPIA.

(*Concluded from page* 615.)

Mr. A. F. Davis, 2, Enfield Road, London, N.—An improved design of firebar is shown, which, it is claimed, is unlike anything previously known to exist for furnace work in general without mechanical appliances of any kind such as forced draught, steam jets, or induced draught. Air apertures are provided through and between the bars, which cause preliminary heating of the air before it passes through the fuel, thus improving combustion in the furnace, and bringing about economy of fuel and increased efficiency. Waste is reduced to a minimum, as a thin perforated clinker is found in small pieces only, in addition to the fine ash falling into the ashpit. Fuel of the lowest grade has been used with these bars to great advantage recently, and smoke trouble ceases where the bars are used, as the combustible gases are dealt with in the furnace almost entirely. Clinker does not adhere to the bars, owing to the increased air pressure at the rear end of the grate caused by the chimney draught.

Messrs. Andre Citroen & Co., 27, Queen Victoria Street, E.C.—This firm's exhibit consists of their well-known double helical gears, some of them of very heavy construction; one set of three rolling-mill pinions, for instance, is shown, each of which weighs 3 tons. Some of the gears are shown in operation. A set of double-reduction gear, consisting of spur and bevel gears contained in a gear box, is included in the exhibit.

Messrs. Lassen & Hjort, 52, Queen Victoria Street, E.C.—The exhibit of this firm comprises their well-known water-softening apparatus, which are shown in operation on the stand, softening London water from 17° to 2°. The special feature of the system is the provision for exact measurement of the water and the chemicals to ensure the desired result. The measuring and mixing apparatus of a large softener having a capacity of 20,000 gallons per hour is shown on the stand, together with other interesting details of the mechanism.

Messrs. Compayne, Ltd., 64, Victoria Street, S.W.—This firm has a very interesting exhibit of power transmission by oil, under the patents of Dr. H. S. Hele-Shaw. The principal feature of this system is the use of a rotary pump with variable stroke, which was described in connection with the Hele-Shaw-Martineau steering gear in our issue of August 9th, 1912, page 209. Fig. 12 shows sections of this pump as actually constructed; the stroke is varied by moving the floating guide ring F F along the line A B, which not only alters the stroke, but if the motion is continued past the central point of zero action, reverses it. The tube D is

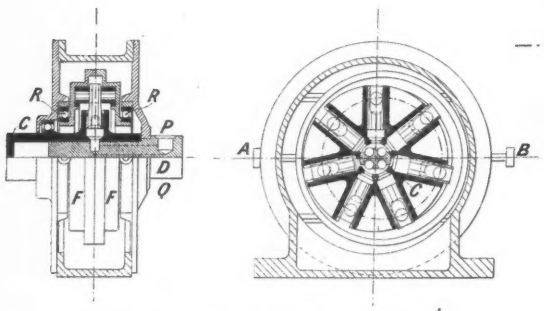


Fig. 12.—Sections of Hele-Shaw Pump.

fixed, and conveys oil to the centre of the pump, whence it flows through ports into the cylinders; when the cylinder body C revolves the ring F moves with it, running freely on the ball bearings R R, which are carried in guide blocks. As C rotates, the pistons in the seven cylinders successively recede from and approach the central tube, receiving oil from one set of ports and discharging it through another set. The pump runs with very little friction, all working parts being copiously lubricated, and wear is practically *nil*; the ordinary maximum working pressure is 1,000 lb. per sq. in., though the pumps will stand 2,000 lb., and the speed is from 750 to 1,400 R.P.M. The efficiency at full load is very high, 90 per cent. being attained.

In transmitting power by this means, a hydraulic motor is used, which is shown in section in fig. 13. Like the pump, this is a rotary machine, and has a double-cam track K for rollers on the piston crossheads L. Thus perfect balance is attained, and the motor runs without vibration, with an efficiency which has exceeded 95 per cent. The motor can be made with various modifications according to circumstances; we need here only consider one important

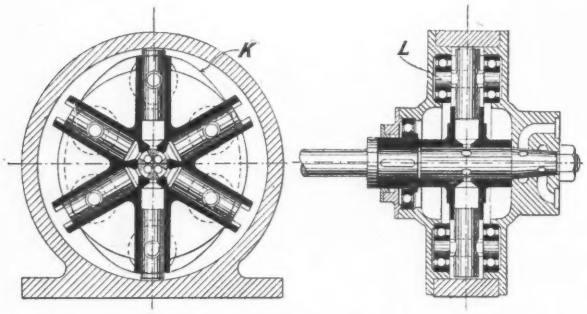


Fig. 13.—Sections of Compayne Double-Cam Motor.

application of the system, which is illustrated in fig. 14. This shows an electric motor E, coupled to a Hele-Shaw pump P, which in turn drives a Compayne double-cam motor M. With this device the motor can be started under zero load, and when running at constant speed is enabled to drive the main shaft at any speed from zero to the maximum, in either direction of rotation. At low speed the oil motor will exert a large torque, as in starting a motor vehicle, and the efficiency in such an application reaches over 75 per cent. (engine to road wheels), while higher efficiencies can be attained. The electrical engineer will at once see that this system enables the inherent advantages of the A.C. motor to be combined with those of the D.C. motor, as lathes, lifts, &c., can be driven at any desired speed, while the motor runs at constant speed, and the motor can be started on light load, reversal of direction can be accomplished without reversing the motor, and so on. Messrs. Waygood have obtained a licence for the use of the system in connection with their electric elevators, and other applications can readily be perceived.

Messrs. John Stirk & Sons, Ltd., Halifax.—One of the largest lathes in the Exhibition is shown by this firm, fitted with their patent motor control and quick-traverse arrangement for the saddle. The lathe is driven by an E.C.C. motor mounted on the headstock, and the special controlling device is attached to the saddle; the motor is started and stopped by push-buttons, and the speed is also raised or lowered in the same manner. The quick traverse is effected by means of a second motor fixed near the end of the lathe bed, and driving a side shaft; this enables the saddle to be traversed from end to end in either direction with rapidity.

Cambridge Scientific Instrument Co., Ltd., Cambridge.—The instruments shown on this stand are mainly those for which the company is so well known in connection with temperature measurement. Resistance and thermoelectric pyrometers, the Whipple temperature indicator (shown in operation, measuring the temperature of a tool-hardening furnace), the thread recorder, &c.,

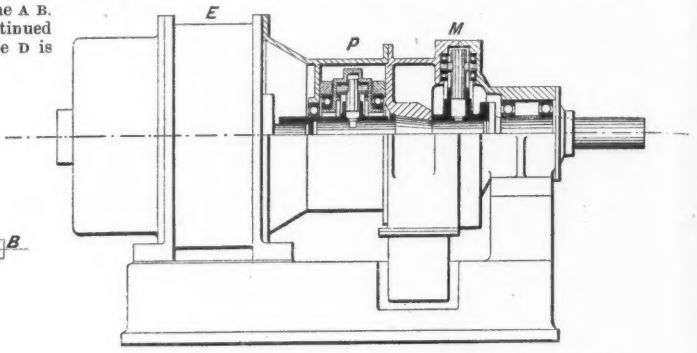


Fig. 14.—Electric Motor with Compayne Transmission Gear.

are all exhibited, as well as the Féry radiation pyrometers and mercurial thermometers. A base-metal thermoelectric pyrometer, in which an iron-constantan couple is used instead of the rare metals, is a notable feature of the exhibit; it is suitable for use up to 800° C. Rosenhain's fuel calorimeter, the bi-meter CO_2 recorder, and other specialities of the firm are also shown.

Fig. 15.—H. & M. Thermograph.

A feature new to this country is the H. & M. thermograph—a recording thermometer for temperatures up to about 700° F.—which has been largely used abroad for recording the temperatures of feed-water, superheated steam, flue gases, &c. The primary object in its design has been to manufacture a simple, cheap, robust, and reliable instrument for everyday use. It gives a record on a circular chart, as shown in fig. 15. The principle made use of is the expansion of mercury, which is contained in a very strong steel bulb. This is connected by steel capillary tubing to the recorder itself. A special feature of the instrument is the character of the capillary tubing, which is such as to render the readings of the instrument practically independent of temperature changes round the tubing. Most recorders of this type have hitherto been seriously limited in their accuracy by the fact that changes in temperature of the tubing affect the readings.

Messrs. Scholey & Co., Ltd., 151, Queen Victoria Street, E.C.—This firm exhibits a variety of motor-starting gear, the Hopkins electric speedometer, and the "Tool Steel" gear and pinions; the latter are new to this country, and are made of very hard steel, endowing them with exceptional resistance to wear and tear. The E.M.B. grid resistances and various tools such as electric soldering irons, wax melters, branding irons, &c., are shown.

One of the special features of the exhibit is the "Britannia" metallic-filament lamp, which has only recently been introduced to the market. It is of British manufacture, and is made at what is stated to be the largest and most modern factory in the kingdom, in all the usual sizes and shapes, and for the customary voltages.

Mr. Charles Taylor, Bartholomew Street, Birmingham.—An entirely new machine is exhibited by this firm for cutting off bars or tubes up to a diameter of 3 in. The cutter is rotary, the stock being held stationary, and 3-in. round steel is cut off in 45 seconds.

Messrs. Stuart Turner, Ltd., Henley-on-Thames.—Several small "Stuart" petrol-electric sets are shown on this stand for lighting yachts, country houses, &c. We illustrate one of these, of 300 W. output; the engine is of the vertical two-stroke type and drives the dynamo through a flexible coupling at a speed of 900 or 1,000 R.P.M. Larger sizes are made, as well as sets having as small an output as 150 watts, and motors and switchboards are also shown.

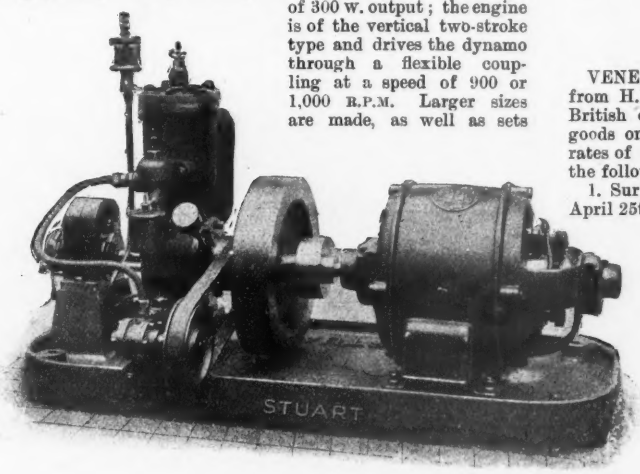


Fig. 16.—"Stuart" Petrol-Electric Yacht-Lighting Set.

Crown Works, Chelmsford.—A variety of magnetic chucks—flat, rotary, and with different formations of holding-face corresponding to the class of work to be handled—is shown at this stand. A demagnetiser is also exhibited, which is used to remove all traces of magnetisation from articles that have been held on the chucks. Generators and motor-generators to supply current to the chucks and demagnetiser are also shown, as well as surface plates and gauges.

The L. S. Starrett Co., 36 and 37, Upper Thames Street, E.C.—This company shows a wide range of tools and micrometer gauges. Amongst the latter the newest is the "Hub" micrometer, the frame of which is specially narrow, so as to pass through a ¾-in. hole in the hub of a cutter. Another novelty is a quickly adjustable micrometer; on pressing the finger against the end of the screw plunger, the nut is released, and the micrometer can at once be opened or closed to any extent within its range. On releasing the plunger, the nut engages the screw, and the fine adjustment is then made in the usual way. Not only is time saved, but continual wear on the screw is thus avoided.

Messrs. Kynoch, Ltd., Lion Works, Witton.—A gas engine of 100 B.H.P. is shown working on this stand, with a patent suction gas plant.

Mr. William Boby, Salisbury House, London Wall, E.C.—Two water softeners are shown by Mr. Boby—the "Simplex" type, in which the reagents are used in the form of a cream of lime and soda, and the type "K" machine, a new softener, in which the reagents are in the form of dry powder. The latter is designed to deal with from 200 gallons per 24 hours to 4,000 gallons per hour, and requires, it is claimed, less attention than any other type.

Mr. John Thompson, Ettingshall Works, Wolverhampton.—The special feature of this stand is a model of the Thompson dish-ended Lancashire boiler, with corrugated flues. There are no internal stays, and the seats for the feed valves and steam gauge are pressed from the solid plate. There are no rivets on the ends except those connecting the flues to the shell, and these are in shear. The "Thompson Mars" bent-tube superheater, with 30 tubes, is also shown, and the "Thompson Mars" economiser with 96 tubes. Another prominent feature of the stand is the Kennicott water softener, having a capacity of 1,250 gallons per hour.

Messrs. W. H. Bailey & Co., Ltd., Albion Works, Salford.—This firm has an interesting display of pumps, air compressors and steam and water fittings, including the "Davidson" feed pump, "Köster's" patent two-stage air compressor, &c.

The Korfund Co., 47, Victoria Street, S.W.—The floor of Stand No. 74 is entirely covered with Korfund anti-vibration material, showing its utility in connection with machine tools.

Unbreakable Pulley and Mill Gearing Co., Ltd., West Gorton, Manchester.—This firm is showing the Cooper all-hard steel roller-bearing at Stands Nos. 12, 60 and 325.

In the foregoing references we have by no means exhausted the features of interest to electrical engineers, especially those engaged in manufacturing processes. For the latter, indeed, there is a wealth of information to be derived from a visit to the Exhibition. To deal with the exhibits of machine tools in detail is not possible in our pages, owing to the pressure on our space; we can only say that the collection at Olympia is probably unique of its kind.

Disclaimer.—Mr. W. W. Martin, electrical engineer, 84, Trinity Road, Birchfield, Birmingham, asks us to say that he is in no way connected with Albert Edward Martin (Midland Electrical Supply Co.) whose bankruptcy proceedings have recently been recorded in our pages.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Amendments.

VENEZUELA.—The Board of Trade have received a dispatch from H.M. Minister at Caracas, suggesting that the attention of British exporters to Venezuela should be drawn to the fact that goods on importation into Venezuela are subject not only to the rates of duty specified in the official Venezuelan Tariff, but also to the following surtaxes:—

1. Surtax of 25 per cent. of the Customs duties payable (decree of April 25th, 1901);

Note.—This surtax is made up of two surtaxes of 12½ per cent. each, called respectively, "*Impuesto Nacional*" and "*Impuesto Territorial*."

2. Surtax of 30 per cent. of the Customs duties payable (decrees of February 16th, 1903, and June 4th, 1912);

3. Health tax (decree of December 29th, 1910) of 1 per cent. of the Customs duties payable + the two surtaxes (*i.e.*, 1·55 per cent. of the Customs duties payable).

Goods proceeding from the Antilles are, on importation into Venezuela, subject to a special surtax of 30 per cent. of the Customs duties payable. The expression "Antilles," as at present interpreted by the Venezuelan authorities, includes not only the British, Dutch, Danish and French West Indian Islands, and Porto Rico, but also Cuba, Haiti and San Domingo. This surtax of 30 per cent. is to be added to the Customs duties, and on the sum thus obtained the surtaxes of 25 per cent. and 30 per cent. mentioned in the preceding paragraph are calculated; the 1 per cent. "health tax" is calculated on the total amount.

The Venezuelan Government has informed H.M. Minister at Caracas, in reply to an inquiry, that goods despatched from Europe or the United States of America, the Consular invoices of which state that they are to be transhipped in the Antilles, are not subject to the special surtax of 30 per cent. levied on goods proceeding from the Antilles; nor is this surtax levied on such goods if they are landed or warehoused in the Antilles for want of ships to effect the transhipment, provided that this circumstance is certified to by the Consul.

NEW ZEALAND.—The New Zealand Customs Authorities have decided that as electric-welded fencing made of metal wire not exceeding three-sixteenths of an inch in diameter can be used for purposes similar to those for which metal-wove wire is used, this wire shall be admitted free of duty if the manufacture of some part of the British Dominions. If of foreign origin the duty will be 10 per cent. *ad valorem*.

CUBA.—With reference to a previous notice in the Electrical Review regarding a Cuban proposal to revise the tariff of import duties on goods imported into the Island by increasing the duties on goods from countries which have not concluded reciprocity treaties with Cuba, it is now notified that this proposal has been dropped.

SIERRA LEONE.—The Government, by Order in Council of June 17th, have decided to include the following in the list of goods admitted free of duty into the Colony:—

Motor vehicles and engines used for industrial or commercial purposes, and all accessories thereto, and (if imported at the same time) tools and implements for use in connection therewith when admitted as such by the Collector of Customs.

Oils, greases, petrol and other non-portable spirits for use as motor power or lubrication for motor vehicles and engines, used for industrial or commercial purposes, and imported by or on behalf of the owners of motor vehicles and engines, when admitted as such by the Collector of Customs.

NORWAY.—The Norwegian Customs Authorities have decided that the exemption from duty recently granted for electrical circuit-breakers shall only apply to such circuit-breakers as are used in electric light installations in houses, &c.

BELGIUM.—The Belgian Government have arranged for the temporary free importation of goods imported for exhibition in the International Exhibition to be held at Ghent in 1913, provided they are subsequently re-exported, and the Customs formalities are duly complied with.

ITALY.—The Italian Customs authorities have decided that electrodes for industrial use made of a combination of ferric oxide (ossido ferroso-ferrico fuso) shall be dutiable as "carbons for use as electrodes for industrial purposes," at the rate of 3 lire per 100 kg. gross weight (1s. 2½d. per cwt.).

Negative Plates of Accumulators.—In an article in *La Revue Electrique*, Messrs. Askenasy and von Putnsky describe experiments on the effect of adding a small quantity of inert matter to the paste in making negative plates. The effect at first is inappreciable, but after 500 discharges, with 1 per cent. of inert matter present in the paste, the ampere-hour capacity of the plates is materially greater than that of plates without this addition.

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

22,784. "Electric incandescent globes." A. J. Laird. October 7th.

22,786. "Device to ensure that the isolating trip cock and the trip cock on electric trains shall be properly set for operation whenever a train is in motion." A. G. T. Wilding. October 7th.

22,788. "Lifeguard for mechanical road and street vehicles, driven by any kind of power, as steam, gas, petrol, hydraulic power, compressed air, electricity, and so on." H. Conradi. October 7th.

22,805. "Antennæ used for transmitting and receiving radio-electric waves for telegraphic messages or electric energy." C. T. A. Hanssen. (A. J. T. Hanssen, Germany.) October 7th.

22,807. "Portable device for use in connection with an ordinary bath for the application of electricity to the human body." H. S. Turner. October 7th.

22,833. "Electric signalling systems." C. W. Ward. October 7th. (Complete.)

22,851. "Electric animal and insect exterminators." C. C. Tuch. (Convention date, October 17th, 1911, United States.) October 7th. (Complete.)

22,852. "Electrical mixing machines." P. Young. October 7th. Complete.)

22,875. "Method of producing high-frequency oscillations." K. Rottgardt. (Convention date, October 7th, 1911, Germany.) October 7th. (Complete.)

22,882. "Wireless light control switch." W. H. Whiteside. October 8th.

22,885. "Electric-light fittings." J. Lutley. October 8th.

22,893. "Sunk switch boxes, plug and socket boxes, bell-push boxes for electric lighting and electric bell work." J. B. Meiklejohn. October 8th.

22,947. "Perforating slip to be employed in the transmission of telegraphic messages." R. St. J. Canney and W. J. Richards. October 8th.

22,952. "Electric lamps." F. B. Cannock. October 8th. (Complete.)

22,959. "Controllers for electric motors and like apparatus." G. Ellison and M. R. H. Mueller. October 8th.

22,972. "Production of light and other radiations." S. O. Hoffmann. October 8th. (Complete.)

22,976. "Automatic device for the protection of electrical circuits." P. M. Levy, H. T. George and C. G. E. Milne. October 8th.

22,985. "Brush-holders for dynamo-electric machines." J. H. Holmes. October 8th. (Complete.)

22,995. "Sparking plug for internal combustion engines." J. Collins. October 9th.

23,004. "Electric leakage indicators." R. McFarlane-Marshall. October 9th.

23,014. "Electric distribution fuseboard." H. B. Prentice and H. Atlay. October 9th.

23,024. "Electric discharge apparatus." Q. Majorana. October 9th. (Complete.)

23,037. "Devices for supporting overhead trolley wires for electric railways, tramways and the like." H. W. H. Richards. October 9th.

23,046. "Driving mechanism of magneto-ignition machines having oscillating armatures." R. Bosch (firm of). (Convention date, May 3rd, 1912, Germany.) October 9th. (Complete.)

23,050. "Process for the manufacture of heat refractory articles from tantalum." Siemens & Halske Akt.-Ges. (Convention date, October 21st, 1911, Germany.) October 9th. (Complete.)

23,082. "Electric heating and cooking apparatus." R. F. Venner. October 9th.

23,086. "Electric incandescent lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 9th.

23,096. "Method of and means for electrolytically depositing metal upon the interior of tubes and other hollow articles or the like." G. P. M. Lee and W. A. Brame. October 10th.

23,110. "Apparatus for the measurement of gases liberated by electrolysis." T. Rooke. October 10th.

23,150. "Electromagnetic clutches in machines with reversal of motion." E. C. R. Marks. ("Vulkan" Maschinen-Fabriks Akt-Ges. Austria.) October 10th. (Complete.)

23,155. "Arc lamps." L. Kamm. (Divided application on 24,333/11, November 2nd.)

23,169. "Process and devices for producing in a continuous manner Röntgen rays having any desired degree of hardness which can be adjusted at a moment's notice." J. E. Lilienfeld. (Convention date, October 10th, 1911, Germany.) October 10th. (Complete.)

23,207. "Self-regulating electric generators or motor-generators." E. L. Frenot. October 10th. (Complete.)

23,208. "Electric transformers." British Thomson-Houston Co., Ltd., E. B. Wedmore and J. M. Wallace. October 10th.

23,240. "Telephone receivers." A. Marr. October 11th.

23,251. "Electric controllers." J. McCallum. October 11th.

23,258. "Sanitary attachment for the mouthpiece of a telephone transmitter." J. P. Vinall. October 11th.

23,273. "Variable speed dynamos for use in starting internal combustion engines and the like." H. Leitner. October 11th.

23,279. "Electrical apparatus for moving railway points or the like, or controlling an electric motor to run a predetermined number of revolutions in either direction alternately." J. H. Gath. October 11th.

23,285. "Arrangements for obtaining sparkless commutation in rotary converters coupled to alternating-current booster." Siemens-Schuckertwerke G.m.b.H. (Convention date, November 14th, 1911, Germany.) October 11th. (Complete.)

23,341. "Regulation of the speed of electric motors." Siemens-Schuckertwerke G.m.b.H. (Convention date, October 13th, 1911, Germany.) October 12th. (Complete.)

23,344. "Method of and means for preventing explosions in mines by damaged electric lamps and motors." F. Palmer. October 12th.

23,372. "Regulation of dynamo-electric machines." Allgemeine Elektricitats-Ges. (Convention date, October 13th, 1911, Germany.) October 12th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

Telephonic Apparatus. F. L. Muirhead. 21,689. October 2nd.

Vapour-Electric Apparatus. P. C. Hewitt. 21,828. October 3rd.

Electrical Measuring Instruments having Movable Coils. J. W. Record. 22,656. October 14th.

Method of Producing Ferro-Silicon. C. Bingham. 22,755. October 16th.

Intercommunication Telephone Systems. British Insulated and Helsby Cables, Ltd., W. A. Aitken, H. Cooper and C. Remington. 22,983. October 18th.

Electric Light Fittings. Simplex Conduits, Ltd., and T. Birkett. 22,988. October 18th.

Electrical Heating Devices. J. F. Monnot. 22,992. October 18th. (November 12th, 1910.)

Electrical Switches or Contact Make-and-Break Devices. R. R. Smith and F. B. Cox. 23,162. October 20th. (April 22nd, 1912.)

Electric Clutch for Controlling Railway Signals. A. H. Johnson and W. J. Thorrowgood. 26,111. November 22nd.

Burglar and like Alarms. A. Richon. 27,697. December 9th.

Electric Safety Lamps suitable for use in Mines. W. H. Lowe. 28,749. December 20th.

Electric Resistance Material. British Thomson-Houston Co. (General Electric Co.) 28,869. December 21st.

Production of Periodically-Varying Currents of High Frequency. E. Weintraub. 14,504. June 18th. (June 18th, 1910.)

Electrical Switches. H. W. Cox. 21,087. September 23rd.

Power and Electrical Installation of Power-Propelled Vehicles. F. W. Lanchester. 21,822. September 27th.

Dynamo-Electric Machines. Hon. Sir C. A. Parsons and A. H. Law. 21,496. September 29th.

Automatic Electric Switching Apparatus. A. J. Howard and A. C. Allen. 21,649. October 2nd.

Means of Enclosing Electrical Apparatus. A. H. Curtis and Adams Manufacturing Co. 22,372. October 11th.

Joining or Bonding the Junctions of Metallic Sheathing or Armouring of Electric Conductors. L. Sunderland. 22,550. October 12th.

Calling Apparatus for Telephones and the like. P. W. Wall. 23,122 October 19th.

Electric Furnace. G. Mettler. 25,890. November 20th.

Method of Storing Wired Detonators. N. Field. 26,044. November 21st. (Patent of addition not granted.)

1912.

Electric Connecting Plugs. British Thomson-Houston Co. (General Electric Co.) 285. January 3rd.

Electricity Meters. Firm of Landis & Gyr. 1,010. January 12th. (August 19th, 1911.)

Electric Railway Systems. J. J. Deschamps. 2,825. January 29th. (January 30th, 1911.)

Intercommunication Telephone Systems. E. R. Corwin. 3,097. February 7th.

Lead Storage Battery Electrodes and Processes of Making Them. W. Morrison. 7,253. March 25th.

Refillable Cartridge-Fuse for Electrical Purposes. E. B. Mallory. 8,110. April 3rd. (April 3rd, 1911.)

Electric Refining Crucibles. E. C. R. Marks. (Patents Purchasing Co.) 8,790. April 18th.

Electric Fuses. S. D. Sprong and W. E. McCoy. 12,701. May 29th.

Multiple Carbon Arc Lamps. Korting & Mathiesen Akt.-Ges. 14,872. June 25th. (June 30th, 1911. Patent of addition not granted.)

Fuses for use in Electrical Circuits. Siemens Schuckertwerke Ges. 19,980. September 2nd. (September 2nd, 1911.)

Electrically-Heated Stoves. British Thomson-Houston Co. (General Electric Co.) 723. January 9th.

Electric Lifts of the Alternating Type and the like. H. J. Moysey. 3,144. February 7th.

Means of Making Contact or Operating Electric Signals for use Principally in Mines. M. Fryar. 5,919. March 9th.

Electric Time Switches. F. Schmid. 6,078. March 11th. (August 10th, 1911.)

Apparatus for the Generation of Electricity from the Motion or Currents of Water. A. Visser, de Goede and de Veen. 6,962. March 21st.

Apparatus for Indicating Speeds at a Distance. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 6,977. March 21st.

Anode Supports for use in Electroplating. Spirella Co. of Great Britain. (Spirella Co.) 9,148. April 18th.

Electric Traps for Rats and the like. S. Takacs. 9,263. April 19th.

Devices for Adjustably Suspending Electric and other Lamps, Electroliers, Gas Pendants and the like. W. H. Sturge. 9,900. April 26th.

Telephone Receivers. J. Parr. 10,616. May 4th

Alternating-Current Distribution Systems. S. D. Sprong and W. E. McCoy. 12,682. May 29th.

Earthing Arrangements for Electrical Systems. Siemens Schuckertwerke G.m.b.H. 12,738. May 30th. (May 30th, 1911.)

Arc Lamps. H. E. Moul. (Korting & Mathieson Akt.-Ges.) 14,516. June 21st.

Electrical Junction Boxes. T. E. Murray. 19,534. August 26th. (September 11th, 1911.)

Electrical Motor-Vehicles in America.—A meeting of the Electric Vehicle Association of America was held in Boston on the 8th and 9th inst., when among the papers read was one on "Street and Traffic Conditions as Applied to the Use of Electrical Vehicles," by Mr. R. McAllister Lloyd, of New York, another entitled "Some Recent Developments in the Lead Battery," by Mr. Bruce Ford, of Philadelphia, and one on "Electrical Vehicle Charging Apparatus," by Mr. R. E. Russell, of the General Electric Co., Schenectady, New York.

Hampton Court Fire Protection.—The Gamewell system of fire protection has been completed at the Palace by Mr. G. L. Beasley, of 10, Warwick Court, W.C. There are 64 alarm boxes, the operation of any one of which punches a time recorder in the fire station and at the same time rings a gong and displays a numbered disk in each of the 27 firemen's houses. Telephonic messages can be sent from any box. The storage batteries, in duplicate, are supplied automatically from the local lighting mains.

The Lighting of the House of Commons.—Answering a Parliamentary question by Mr. King, Mr. W. Benn says that the First Commissioner of Works has now substituted electric light for gas in the Chamber of the House, and the result is satisfactory.